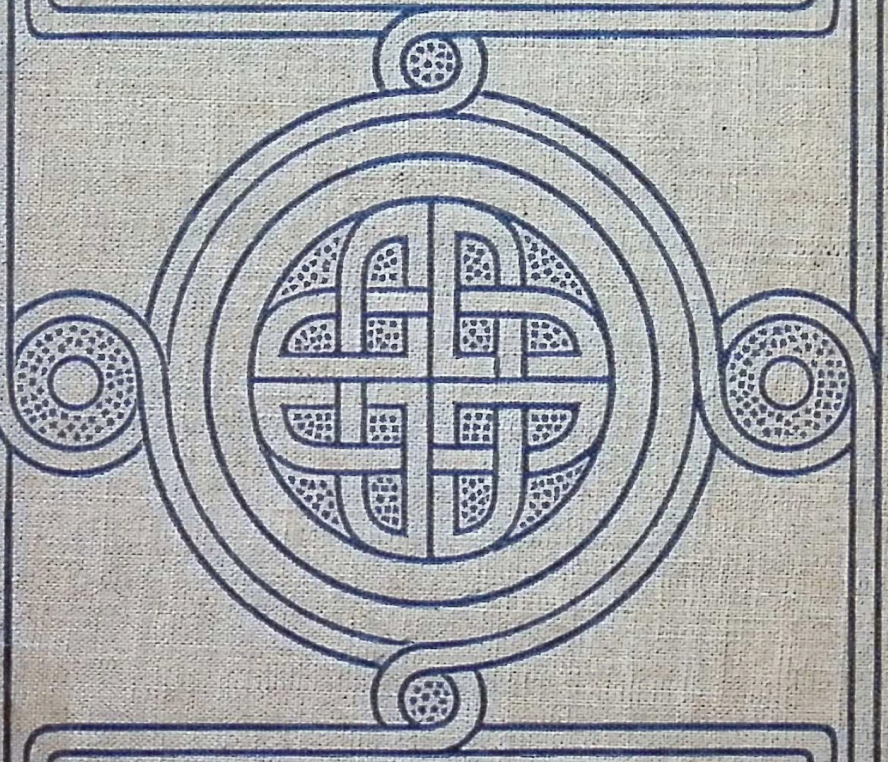
THE ART CRAFTS FOR BEGINNERS



BY FRANK G SANFORD

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THE ART CRAFTS FOR BEGINNERS

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BY

FRANK G. SANFORD

DIRECTOR OF ARTS CRAFTS, CHAUTAUQUA, N. Y.

ILLUSTRATED WITH WORKING DRAWINGS BY THE AUTHOR AND PHOTOGRAPHS

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To those who feel the need of some art expression, but who cannot attend an art school; to those who wish to follow the art of the craftsman; to those teachers upon whom demand is made for knowledge of the crafts—this little volume is addressed.

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INTRODUCTION

IT often happens that young people with talent and a strong feeling for art wish to go further in their study than is possible within the limits of the average school. There are two courses open to such students. They can enter an art academy, or they can acquire such training as comes from the study of books, works of art, and through private instruction. Of these two courses, the former is much to be preferred, providing that the art school selected is influenced by the modern art spirit.

The old academic instruction differs from the new in its recognition of historic styles as the basis or foundation of design. In contrast to this, modern academic instruction emphasizes the importance of the greatest possible freedom of invention, such invention, however, to be controlled by the laws of

beauty. It can readily be seen that the old academic methods tend to crush individuality, and are inherently opposed to the very processes that called into life the beautiful art known as historic styles.

The new academic thought insists that the designer shall be himself; that he shall draw his inspiration from nature and the immediate needs of his surroundings. The historic styles may be his grammar, from which he may learn how to use the material supplied by nature. Historic art may teach him *how* to design; it can never, alone, teach him design.

Not only do modern methods allow freedom of expression, but they urge actual construction. He who would understand design must know the steps, by actual experience, from the inception of the idea and its expression on paper to the ultimate material completion of the object.

That there is danger of dissipating one's energies, acquiring thus but a superficial acquaintance with many crafts and materials, is very true. But a knowledge of the possibilities and limitations of different mediums, such as clay, leather, or wood, and a further discovery of new combinations of materials widen the artistic horizon to an almost limitless extent. Moreover, the designer need go but a little way with

numerous materials. A few elementary exercises done in a workmanlike manner will be sufficient. The experience thus gained should enable him to make consistent designs. The true craftsman should be able to express his idea upon paper, and to proceed to the actual carrying out of that idea in material terms.

The potter may serve as an illustration of what a craftsman should be. The potter has in mind, for instance, a certain kind of vase or tile. Sometimes he expresses his idea on paper, and sometimes he works from his mental image. But the joy of the work consists in making the yielding mass obey the art impulse of the mind.

I stood in silence and apart,
And wondered more and more to see
That shapeless, lifeless mass of clay
Rise up to meet the master's hand,
And now contract and now expand,
And even his slightest touch obey.

Not many years ago the study of the arts was considered to be an ornament, rather than an essential, in education; but the growing interest in the crafts, shown in our own and in foreign countries,

proves the old idea to be erroneous. So rapid has been the progress in the development of the desire for beauty and its realizations in objects of our immediate environment, that popular education can no longer ignore the demands of the times. Some attempt to teach at least the elements of the arts and crafts is now made in nearly all schools.

The craft work in this book, while of such a nature as will especially appeal to amateurs, is arranged in progressive lessons of increasing difficulty, so that it may easily be adapted to school conditions.

Many of the objects herein illustrated and developed have been successfully worked out by seventh- and eighth-grade and high-school students, teachers and pupils working together with equal interest.

This book does not enter the wide realm of the professional worker. The solution of his complex and difficult problems is not attempted here. Its mission will be accomplished if it serves to open the mind of the student to the possibilities of his immediate environment, and if the doing of the exercises prepares the way for the more serious work of the professional craftsman.

THE ART CRAFTS FOR BEGINNERS

THE ART CRAFTS
FOR BEGINNERS

CHAPTER I

DESIGN[1]

OLD as the first mat-weaving is the principle that design is the child of necessity; and in every design I would ask myself these questions:

1. What is the purpose of this object that I am about to make?
2. What is the form best suited to that purpose?
3. What is the best material—wood, metal, or clay—for my purpose?

[1] Those whose creative ability is so limited as to discourage them in any attempt at original designing may yet be successful in craftsmanship, relying more upon mechanical skill and artistic perception in the careful copying or adaptation of such good designs as are available.

4. How will the material and use of the object suggest and limit the ornament to be placed upon it?

Except for a few suggestions, I shall not treat the subject design in any general way, thinking it better that each material shall deal concretely with its own design according to its natural strength or limitations. The drawings are mostly from the work of the writer or his pupils, and they seem to him at this present writing good and consistent, but they are only the result of a very limited experience, and as such are offered to the public.

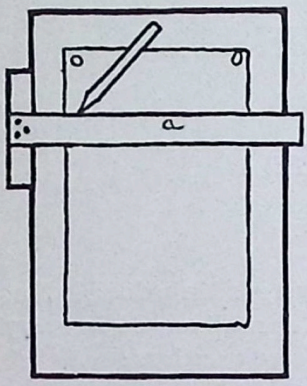


Fig. 1

The desire for novelty has been the impetus to much true progress in design, yet in a superficial way it may be harmful. To avoid eclecticism, and build, as far as we do build, upon a solid foundation, should be our ideal, rather than to attain the startling and the clever. The principle learned from my first instructor in drawing—Charles Fox—has seemed to me an eminently

safe one: above the historic schools, above the law of abstract beauty, great as it may be, is the greater law of *special beauty*, or *harmony of character*, including the others as the greater includes the less.

Volumes have been and will be written upon design. They, and the schools founded upon them, all have considerable truth and may teach us much, in spite of their inevitable limitations. I say inevitable, because in art, as in ethics, no one has yet found the whole truth.

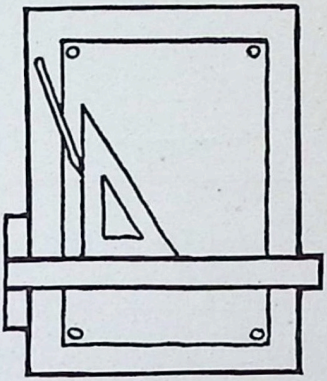


Fig. 2

The term "design" in its broad sense means to plan, and includes not only design in its constructive and decorative sense, but all arrangements of lines and masses in pictorial composition as well.

"Ornament" means that which is applied to embellish, decorate, or beautify, and in its best sense must always be subordinated to the purpose, material, and structure of the object or building decorated, and should never be treated as an independent or iso-

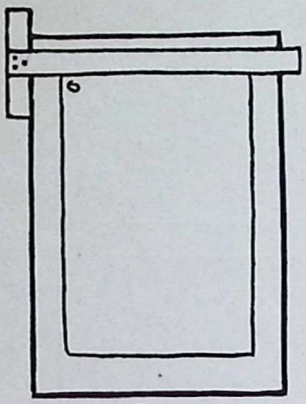


Fig. 3

lated thing. It is best where it is strictly dependent.

This is so little understood by beginners that they consider anything which is in itself beautiful or interesting may be utilized as ornament. Hence the frequent application of pictorial motives to pottery, frames, sofa-pillows, and what not. Especially in the easily learned art of pyrography is this noticeable.

A picture is an independent thought or aspect of nature expressed in any medium one chooses—a thing complete in itself.

It needs a volume to define and illustrate these things clearly, and the purpose here is rather to suggest, with specific and concrete illustrations to follow in several of the chapters. For the historic development of ornament, consult the books of Walter Crane and Lewis F. Day, excellent writers on this subject.

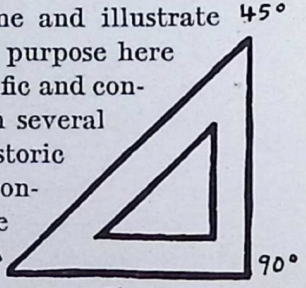


Fig. 4

In touching on the machinery of design we consider ornament under three general heads: naturalistic, conventional, and geometric.

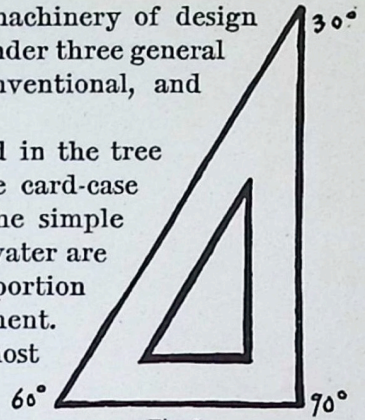


Fig. 5

The first is illustrated in the tree and road pattern for the card-case (see Leather), where the simple lines of tree, road, and water are placed in a pleasing proportion but realistic arrangement. This is the character of most of the art of the Japanese and the art of those who follow them (see also Figs. 7 and 12).

The second, or conventional method, is illustrated in the taking of a flower or natural object; and setting aside accidental variations of individual specimens, the typic lines of growth and characteristic curves are abstracted. This is shown in the tulip, Fig. 8, the birds from Indian baskets, Figs. 9 and 10, and the bead-belt design (see Bead-work).

The third, or geometric division, is where purely abstract and geometric forms are used, straight-line patterns and the like, some of them developed from modes of working, structural necessities, or

THE NATURAL FLOWER
Fig. 6

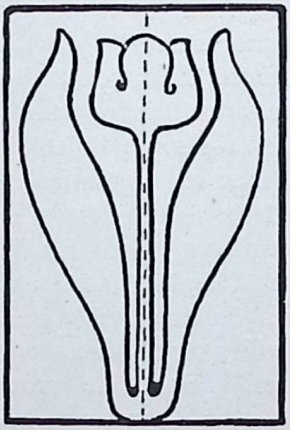
weaving and knotting, as in the Celtic interlaces.

In planning ornament the first consideration should be subordination to use and construction in its amount and distribution; following this, harmony of line. These we may call the special or concrete considerations of each design.

But beyond this are the general rules of all ornament, — the things usually taught first in any school, — and which we may call the abstract considerations. First, proportion, or the pleasing arrangement of parts as to size and space, and in such manner as to avoid monotony or undue repetition. Second, and related closely to the first, is balance, or the distribution of parts and elements of a design so that the interest shall not be centered unduly upon one point. Balance of design is something found in all good composition, from the frescos of Angelo to the Dutch interiors and the landscapes of Corot, although in the

examples cited it is irregular, as is the case in most of the Japanese ornament, which is pictorial in character.

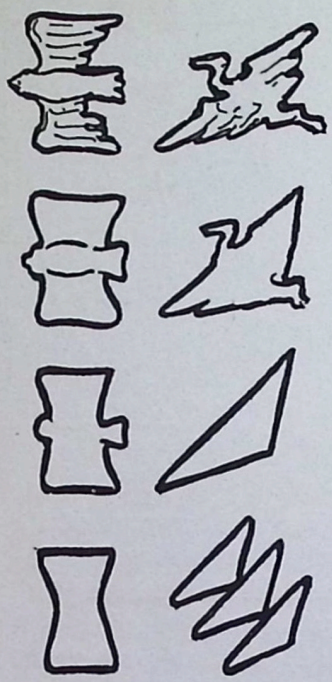
In the example of the card-case (see Leather) note that the dark roadway and sky are balanced by the decided lines of the tree, which thus become important in the composition.



THE CONVENTIONAL RENDERING
Fig. 8

THE CHARACTER LINES
Fig. 7

The greater part of the designs in this book are included in the second division under the heading Balance; that is, symmetrical balance, or the exact balance of one part to another, as the two sides of the frames, the sconce, or as in Fig. 8. Symmetrical balance is sometimes of two parts, as in the



THE CONVENTIONAL ORNAMENT AND ITS DERIVATION

Fig. 9

examples above referred to, or of three, four, or any number of repeating parts.

Here the principle of radiation comes in, as shown in Figs. 11 and 12.

The development of a design from a single center or many centers is also illustrated here.

Fig. 11 is a conventional stencil pattern derived from the hollyhock, and intended to decorate some object in leather or fabric which will lie flat and be seen from any side. Hence the advisability of a pattern which will look equally well from all sides. For the same reason a radiating pattern is best for the tray (see chapter on Metal-work). Fig. 12 is an irregular

radiating pattern, realistic in treatment. The small sketch shows the basic principle of leaf and stem radiation.

Decoration which is to be applied to a flat surface should observe that same flatness and reserve in color that it does in line and form.

Color is touched upon in several of the chapters of this book. Some of the crafts here treated, as leather and metal, are colorful enough in their material. Bead-work is most satisfactory in pure, bright colors. In basketry, black and dull red, with the natural tawny colors of raffia and reed, certainly give scope enough to harmonize with the very restricted forms which may be worked up in this material.

In woodwork it is better to handle a few harmonious stains, such as may be mixed from the list of colors given, than to risk over-coloring and pettiness from using many tints.

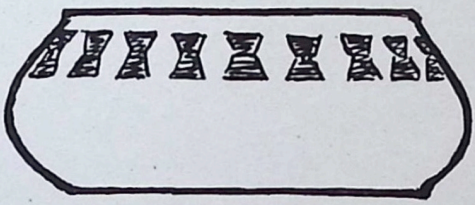


Fig. 10

I do not wish to be dogmatic, but

I regard three tones of color as sufficient on any one piece.

Many valuable suggestions may be got from the colored plates of the art magazines, like the "Studio." The "School Arts Book" offers many ideas. If you have the opportunity, study good Japanese prints for their wonderful rich stains and delicate tints; and, above all, nature, with her wonderful deep-orange and brown scales, her staccatos of yellows and pale greens, and the wealth of her gamut of red.

As this book is intended to reach those who have little or no knowledge of design methods, it seems best to

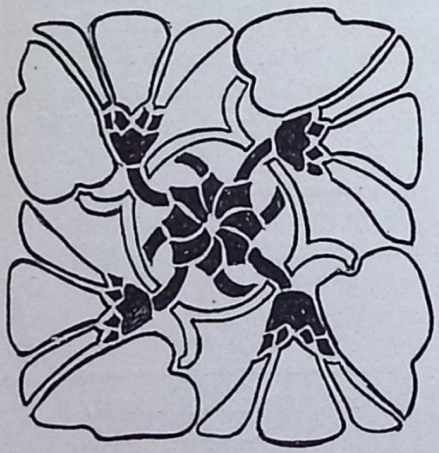


Fig. 11
CONVENTIONAL RADIATION AND FOUR PART SYMMETRY

IRREGULAR RADIATION OF NATURE

Fig. 12

offer some explanation of the simpler methods of drafting.

Following is a list of necessary drawing-tools, with their approximate cost:

A pine drawing-board about 20″ × 26″	$1.20
A T-square, 24″ blade	.25
A 45° amber triangle, length 8″	.60
Or a 45° wood triangle, length 8″	.25
A 30° × 60° triangle	.25
A combination dividers and compass	.50
A 1′ boxwood beveled rule	.10
Some sheets of black carbon transfer-paper, thumb-tacks, eraser, and pencils.	

It is an excellent thing to have a complete set of drawing-instruments, such as may be purchased for $4.50 or $5, but these are not necessary.

All horizontal lines are drawn with the T-square, the head of which rests closely against the left edge of the drawing-board (Fig. 1), and is held in place firmly by the left hand, leaving the right hand free to point and draw.

Horizontals are usually drawn along the upper side of the blade of the T-square, as indicated by pencil, Fig. 1. The T-square is used only from one edge of the board, for this reason, that otherwise one cannot be sure that all edges of the board are parallel or at right angles each to each; and unless they be so, drawing by squaring from any side at random would not give a true line. All verticals are drawn by placing the triangle upon the T-square, and sliding back and forth to the points from which lines are to be drawn, as in Fig. 2. Angles are drawn similarly.

To adjust a paper to the board, place it at about the center, and insert a tack in the upper left corner. Place the T-square so that the lower edge touches this point, and, bringing the other corner up against the square, insert the second tack; lastly the two lower corners (Fig. 3) are securely tacked.

CHAPTER II

THIN WOOD-WORKING

PROBLEM I — Calendar-back
PROBLEM II — Sun-dial
PROBLEM III — Picture-frame
PROBLEM IV — Envelop-holder
PROBLEM V — Pencil-box

CHAPTER II

THIN WOOD-WORKING

WORKING in wood, with the knife as a principal cutting-tool, has fallen into disfavor in some places because it is thought to mean the old sloyd system of copying a fixed set of colorless models. Adhering to the sloyd constructive principles, which are good, but introducing original design and color, this work may be made very valuable in schools and of interest to adults who wish to work with a few simple tools. Some of the objects in the following chapters were worked out very successfully by the boys of Oak Park (Illinois) public schools.

Following is a special wood-working equipment, which has been selected with a view to economy and home conditions:

SPECIAL EQUIPMENT

A No. 6 sloyd whittling-knife, 40 cents. In place of this an ordinary jack-knife will do, if the blade is ground to a point. The jack-knife blade usually ends in a point like Fig. 1, *a*, but for good work we need the blade pointed as shown in Fig. 1, *b*, the form of the sloyd knife.

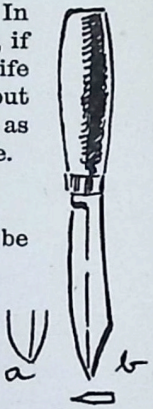


Fig. 1

A small tack- or brad-hammer, 30 cents.

Some $\frac{1}{2}''$ and $\frac{3}{8}''$ steel brads.

A can of Le Page's liquid glue, 25 cents, to be warmed before using.

Some sheets of 00 sandpaper.

A piece of clear wood, $\frac{7}{8}''$ thick at least, $9' \times 12'$ in size, to be used as a cutting-board.

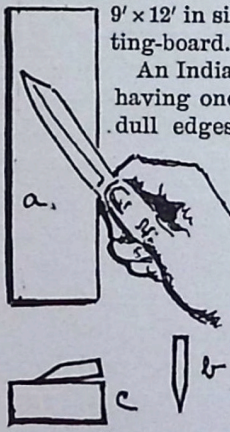


Fig. 2

An India combination oilstone, having one side coarse for very dull edges, and the other side fine. With case, $1.

An oil-can filled with kerosene or lard oil. Vegetable oil should not be used, as it hardens and clogs the stones. Some cotton cloth or waste for wiping tools and stone.

A bit of belt or thick leather for strapping your knife. This may be covered with a mixture of emery flour and oil.

A 6″ try-square as in Figs. 8, 9, 25 cents.

A ¼″ auger-bit, 40 cents.

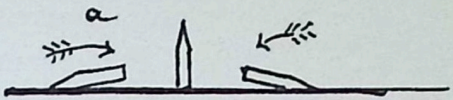


Fig. 3

A small brad-awl, 10 cents.

Some pieces of clear white basswood; these may be had of any dealer in fine woods or veneering. Get some of them planed down to $\frac{3}{16}$″, and for convenience some to ¼″ thickness, and cut to about 4′ lengths.

4 wooden hand-screws (see Fig. 4), 35 cents each.

FOR COLORING

1 tube	ivory black (oil color)	5c.
1 "	burnt umber "	5c.
1 "	light red "	5c.
1 "	Prussian blue "	5c.
1 "	chrome yellow "	5c.

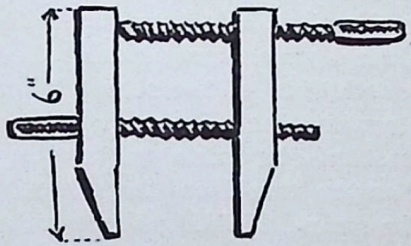


Fig. 4

A cheap grade of colors will answer the purpose.

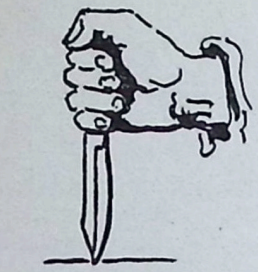
A small tin or dish for mixing colors.

A small paint-brush that will point well.

Some turpentine or benzine.

A clean cloth.

A lump of beeswax.



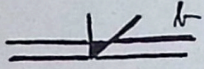


Fig. 5

A sharp knife is of first importance in this work, hence the oilstone and strap. When you purchase your knife it will not have a good cutting-edge, but will need whetting upon the stone. Grind it upon the coarse side, first putting a few drops of oil upon the stone. If you do not use oil, the friction of rubbing the blade will heat and take out the temper from the steel.

Notice the shape of the knife-blade (Fig. 2, *b*), and that the bevel is held flat on the stone *c*. Rub the knife back and forth without lifting it from the stone, and holding it at an angle of 45°, as shown in *a*, Fig. 2, first on one side the blade, then upon the other, until you produce a wire edge. Next rub it a little upon the smooth side of the stone; then strap the blade to remove the wire edge. It is obvious that you cannot rub the knife on the strap in the same manner as you would on the stone, or you will surely cut the strap. Holding the knife as shown in Fig. 2, pull it in the direction shown by the

arrow *a*, Fig. 3, turn it on its back (not on the edge), and pull it back along the strap; it is precisely the same as strapping a razor. Keep this up until the wire edge disappears.

Sharpening tools is one of the most difficult things in wood-working, and it is a question as to when children can be taught to do this.

Be careful to strap your knife clear to the point, because much important work is done with the point.

Now try a simple exercise in straight cutting. On a piece of the basswood mark out a rectangle $4\frac{1}{4}'' \times 1''$, long side running with the grain—that is, with the fibers of the wood. Hold the knife as shown in Fig. 5, and make a vertical cut on the line across grain, drawing the knife toward you. Outside the line make an oblique cut (Fig. 5, *b*), repeating this until the wood is severed. This cutting is done upon your soft wood-block. Cutting with the grain is much easier; simply repeat your vertical cut until you pierce the wood. With the rule draw

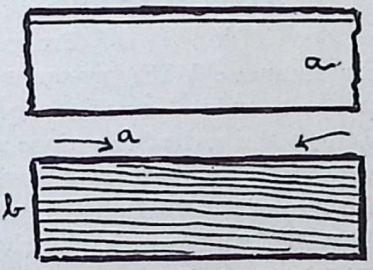


Fig. 6

a line parallel to the long edge, about $\frac{1}{8}''$ (Fig. 6, *a*) from it. Always try the wood before cutting into it, to ascertain which way the grain runs. In clear basswood it is usually quite straight, but sometimes will run at a slight angle, as in Fig. 6, *b*.

In trimming a long edge like this it will readily be seen that if the knife cuts in direction *a*, it will split the wood. The edge must therefore be trimmed from the opposite edge. Holding your knife as shown in Fig. 7, whittle carefully down to the line with a long even stroke, a little at a time.

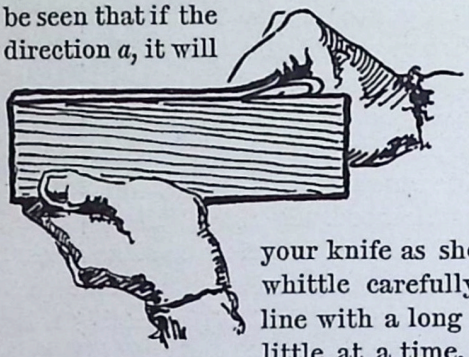


Fig. 7

Prove your cut in the following manner: With try-square across edge (Fig. 8), and with rule along the edge, next draw a line as close to the end of the piece as you can get a square edge (Fig. 9). For fine work it is better to draw this line with a knife, holding it firmly near the point (Fig. 16), and pressing it close to the blade of the try-square.

In squaring across the grain hold the knife as in Fig. 10, drawing it toward you, and keeping the thumb well below the end to avoid cutting your hand.

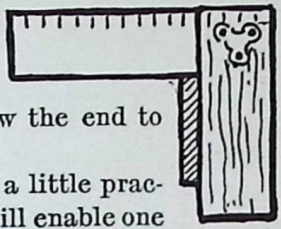


Fig. 8

Pare a little at a time, and a little practice will enable one to make these cuts with skill.

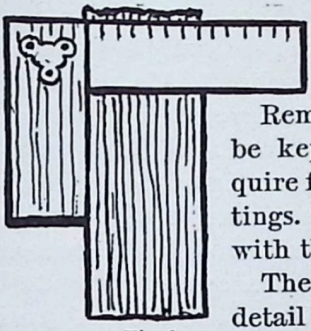


Fig. 9

Remember that the knife should be kept very sharp, and will require frequent strappings and whettings. A great deal can be done with this simple tool.

The foregoing paragraphs give in detail what seem to be the essentials. Practice will, of course, teach far more than mere printed instructions, and a few finger-cuts just at the first will serve to show one that although it is a little tool, and responding steadily to the touch, the knife must be respected.

Fig. 10

PROBLEM I—CALENDAR BACK

Following the method just explained, cut out a piece of $\frac{1}{4}''$ basswood, a little larger (say $\frac{1}{8}''$ all around) than the measurement given in Fig. 11, the grain running as indicated by lines. Square this piece to dimensions given. Now upon a piece of paper which is thin enough to allow of a line being easily transferred through it, and with your instruments, draw a rectangle with a vertical through the center, as shown (Fig. 11). Upon one side of your line draw the curves of the outline, avoiding long, sharp points or deep curves. Fold the paper upon the vertical line, with curves outward, and cut to the curves, thus producing an absolutely symmetrical pattern. You may hold this firmly upon the wood, and draw around it very carefully. Your paper must not be too thin, or this will prove a difficult matter. Common white drawing-paper or brown wrapping-paper will do very well for this. If the paper is

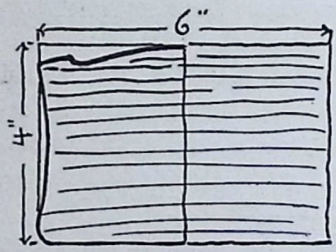


Fig. 11

tacked to the wood, it will leave a permanent scar; so, if you cannot hold it firmly, put a touch of mucilage in two points upon the paper. The pattern may afterward be separated by passing your knife between it and the wood.

Proceed to cut out the curves, and if you undercut or split the wood, try again and do not be discouraged. The sides *a*, *a*, Fig. 12, across the grain, will be pared out as in Fig. 10. The long side *b* with the grain will be done with the knife in the first position (Fig. 7). The curves on side *c* will be cut mostly by carefully paring with the knife held near the point in second position (Fig. 10). The corner curves must be pared in the direction of arrow; for if done in the opposite direction, you will cut into the grain, and will be sure to split off a little of the corner. This principle is demonstrated at Fig. 13, *a* showing the effect of cutting against or into the grain at an angle, *b* showing the proper manner of cutting at an angle with the grain. In working

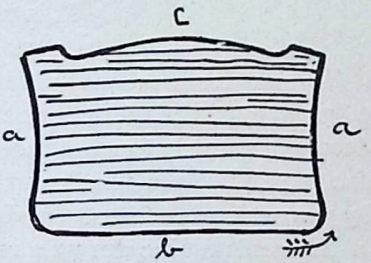


Fig. 12

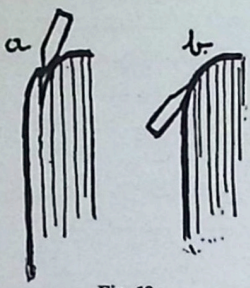


Fig. 13

across the grain you must cut from both sides toward the center. The effect of cutting all the way across from one side is shown in Fig. 14. The wood is split off just at the edge of the piece.

It is very likely you will have to learn this by experience. Accidents of this kind are liable to happen in any piece of whittling, therefore it is not wise to transfer the decoration until after the piece is cut out. Now open the paper pattern, mark out a space to be occupied by your calendar, $2'' \times 3''$, and around it upon one side of the central line draw in some simple line-pattern like the one shown in Fig. 15. Be careful to get a curve with a good even sweep—a regular curve. You will notice those in this design are long and sweeping. A short abrupt curve is difficult to cut by this method with the knife. When the design is drawn upon one side, transfer by folding and rubbing.

Whet the knife to a good point, and, holding it in the position indicated in Fig. 16, make an incision a little outside the pencil-line at an angle of about 45°. Cut in about $\frac{1}{8}''$, slowly drawing the knife toward

you, turn the wood, and cut on the other side of the line, taking out a clean V-shaped groove (Fig. 16). Care must be taken to cut no more than half through the wood, and it is well to practise upon a scrap until you can make a clean cut. The dots marked in Fig. 15 indicate the holes by which the calendar may be suspended. Insert the bit in the center of the hole, and twist it through until the point appears at the back. Insert in this hole at the back, and twist through; this prevents splitting the wood on either side. Sandpaper by wrapping the paper around a smooth block and rubbing the finished work always with the grain. Do not sandpaper the edges, or invariably you will round them and spoil the clean-cut appearance.

Fig. 14

The method of staining is as follows: For a green background, mix a little chrome yellow, a little Prussian blue, and some light red or black. Mix this thoroughly with benzine or turpentine, and cover the whole surface, back, face, and edges, soaking a piece of cloth in the color and rubbing all over the wood. A brush is likely to produce a streaky effect.

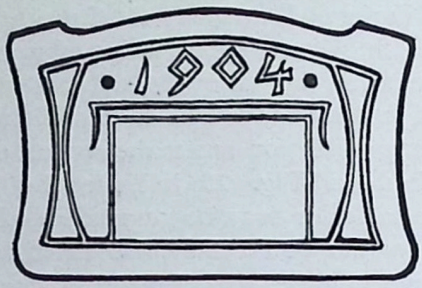


Fig. 15

Be sure to fill all the cuts, and leave no spots or crevices white. Rub this down to an even, clean tone. If there is any "figure" in the wood, this process will bring it out. If your solution is too thick, dilute it, and avoid by all means the effect of paint. If too thin, apply another coat. Also cover both sides as soon as possible with the stain, to save warping through uneven drying. It is unworkmanlike to leave any part unfinished because it is not to be seen. You may have to use your brush to reach the cuts, but avoid this if possible, as it is liable to make the work streaky.

Some of the inclosed spaces of your design may be touched in with pure color, such as light red or Prussian blue. It is best that the under-coat should

nearly dry before applying the others. Also see that the color is not thin enough to spread. This over-color will sink partly into the background, and the effect will be a harmonious blending. It will require several days to dry the color; then finish by applying a thin coat of beeswax. Cut up the wax in a small dish of turpentine, about five parts turpentine to one of wax, and dissolve by heating. When cooled, it should be about the consistency of vaseline. If too hard to be easily spread with the fingers, put more turpentine, and again heat. When cool and your color perfectly dry, apply with your fingers or a soft cloth all over, and rub off to a thin tone.

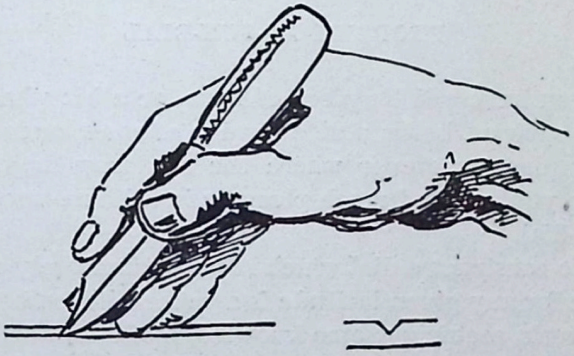


Fig. 16

While it is still soft, carefully remove the wax that may have settled in the cuts. After the wax is dry, finish with the palm of the hand. Water-color may be used for staining, applied in same manner as oil-paint, but is more likely to warp the wood.

The calendar may be attached by some small escutcheon-pins or by gluing.

If glued, it may be necessary to scratch away the stain and wax from the wood surface just beneath the paper, to allow the glue to hold.

The calendar may be bored for hanging on the wall, or it may be finished with braces like the picture-frame described in Problem III.

PROBLEM II—SUN-DIAL

If you have a little piece of lawn, or a bit of a garden spot, or, better still, a garden of roses, or indeed any place whatever where the sun may linger all day, you will find much pleasure in a home-wrought sun-dial.

To construct a dial which shall be absolutely accurate for any given latitude is a rather difficult piece of work, requiring some knowledge of astronomy. I have used a table taken from an article on sun-dials by

Professor Jacoby, which was published in "McClure's Magazine" some time ago. Several dials made according to this table have proved fairly accurate time-keepers.

To those who may wish to study the subject of dials more carefully, I would recommend the article in the "Encyclopædia Britannica."

By referring to the table given on the following page and to the dial which I have worked out for the latitude of Chicago, you can easily construct the plan for a dial in or near any of the cities in the table.

We shall use $\frac{1}{4}''$ basswood, of which you will need one piece cut to $6\frac{1}{2}''$ square and another piece to $7''$ square. For this small knife-work we are using just one half the measurements given in the table.

Now with your instruments—that is, T-square, rule, and triangles—work out your dial-plate upon paper very accurately, according to the latitude of your residence: New York, Boston, or Chicago, as the case may be. You would better go over all measurements at least twice, to make sure of accuracy.

The plan being drawn upon paper, cut it out on the heavy outer line (Fig. 17). The pattern is then fitted exactly into the middle of the smaller square

TABLE SHOWING HOW TO MARK THE HOUR-LINES

Place	*Distance from O to the line marked*			*Distance from M to the line marked*		
	VII	VIII	IX	IX	X	XI
	Inches	Inches	Inches	Inches	Inches	Inches
Albany	1 15-16	4 3-16	7 7-16		3 1-16	1 7-16
Baltimore	2 1-8	4 11-16	8		2 7-8	1 7-16
Boston	2	4 5-16	7 7-16		3 1-16	1 7-16
Buffalo	1 15-16	4 3-16	7 7-16		3 1-16	1 7-16
Charleston	2 7-16	5 3-8		4 3-8	2 1-2	1 1-8
Chicago	2	4 5-16	7 7-16		3 1-16	1 7-16
Cincinnati	2 1-8	4 11-16	8		2 7-8	1 7-16
Cleveland	2	4 5-16	7 7-16		3 1-16	1 7-16
Denver	2 1-8	4 1-2	7 11-16		2 7-8	1 7-16
Detroit	2	4 5-16	7 7-16		3 1-16	1 7-16
Indianapolis	2 1-8	4 11-16	8		2 7-8	1 7-16
Kansas City	2 1-4	4 11-16	8		2 7-8	1 5-16
Louisville	2 1-4	4 11-16	8		2 7-8	1 5-16
Milwaukee	1 15-16	4 3-16	7 7-16		3 1-16	1 7-16
New Orleans	2 11-16	5 3-4		4 1-16	2 5-16	1 1-8
New York	2	4 5-16	7 11-16		3 1-16	1 7-16
Omaha	2	4 5-16	7 11-16		3 1-16	1 7-16
Philadelphia	2 1-8	4 1-2	7 11-16		2 7-8	1 7-16
Pittsburg	2	4 5-16	7 11-16		3 1-16	1 7-16
Portland, Me.	1 15-16	4 3-16	7 1-8		3 3-16	1 1-2
Richmond	2 1-4	4 11-16	8		2 7-8	1 5-16
Rochester	1 15-16	4 3-16	7 7-16		3 1-16	1 7-16
San Diego	2 7-16	5 3-8		4 3-8	2 1-2	1 1-8
San Francisco	2 1-4	4 11-16	8		2 7-8	1 5-16
Savannah	2 9-16	5 9-16		4 1-4	2 1-2	1 1-8
St. Louis	2 1-4	4 11-16	8		2 7-8	1 5-16
St. Paul	1 15-16	4 1-16	7 1-8		3 3-16	1 1-2
Seattle	1 13-16	3 15-16	6 5-8		3 3-8	1 1-2
Wash'ton, D.C.	2 1-8	4 11-16	8		2 7-8	1 7-16

TABLE SHOWING THE LENGTH OF THE SIDE *b c*

PLACE	*b c*	PLACE	*b c*
	Inches		Inches
Albany	4 11-16	New York	4 3-8
Baltimore	4 1-16	Omaha	4 3-8
Boston	4 1-2	Philadelphia	4 3-16
Buffalo	4 11-16	Pittsburg	4 3-8
Charleston	3 1-4	Portland, Me.	4 13-16
Chicago	4 1-2	Richmond	3 15-16
Cincinnati	4 1-16	Rochester	4 11-16
Cleveland	4 1-2	San Diego	3 1-4
Denver	4 3-16	San Francisco	3 15-16
Detroit	4 1-2	Savannah	3 1-8
Indianapolis	4 1-16	St. Louis	3 15-16
Kansas City	3 15-16	St. Paul	5
Louisville	3 15-16	Seattle	5 9-16
Milwaukee	4 11-16	Washington, D. C.	4 1-16
New Orleans	2 7-8		

of wood. Attach it by means of four small pins at the corners of the inner square. Next, with another pin punch through each hour-point upon the square, and also each point where the lines touch the quarter-circles. This being done, remove the plan, and connect the points with light pencil-lines drawn upon the wood.

The hour-lines, quarter-circles, motto, and two inner squares may now be carved in the same manner as the calendar back. The figures for the hours may also be carved, or they may be painted in black.

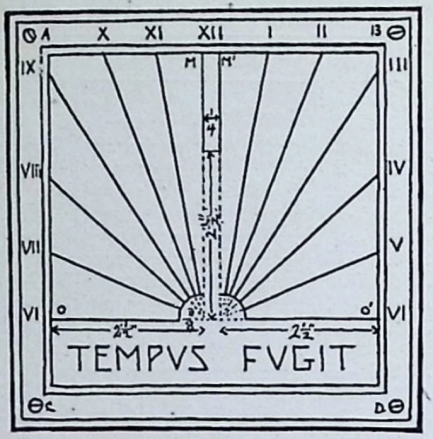


Fig. 17

It is necessary, for a good piece of work, to have all cuts of equal width, and to finish them neatly at the inner end with a clean straight cut across.

In carving the Roman numerals care should be taken not to cut over the edge of the wood,—to allow a small margin on either side the figure,—and in the case of VIII it may be necessary to break the inner squares to accommodate it.

The shadow-piece, or gnomon, is planned by the second table, and cut as shown in Fig. 18. Note that the grain runs parallel with the edge which is to be fastened to the dial-plate. Edges *a* and *b* must be perfectly true and straight, the one because it rests upon the base, the other because it throws the shadow which shall mark the hour.

The back edge *c* is unimportant, and may be cut

into a shallow curve to relieve the rigidity of the piece. Procure some round-head steel or brass screws, $\frac{3}{8}$″ long. Next bore with the small brad-awl holes at *a*, *b*, *c*, *d*, Fig. 17, and placing the pieces so that the grain of the upper square crosses that of the lower (Fig. 19), set in the screws.

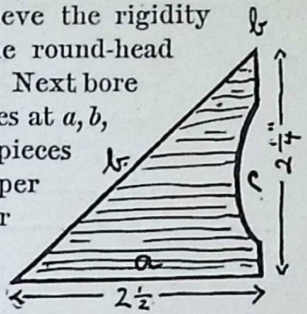


Fig. 18

This crossing the grain prevents warping to a large degree.

The edges of both pieces may be slightly beveled by passing the coarse sandpaper over them.

Upon the dial-plate, in the space left for fastening the shadow-piece, bore two small holes a little smaller than the screws to be used, being careful to penetrate straight into the wood. The screw must be placed far enough back from the point of the gnomon to avoid any possibility of its showing through the shadow-edge.

Fig. 19

After these holes are bored (see Fig. 20), set the screws in from the back of the base piece,

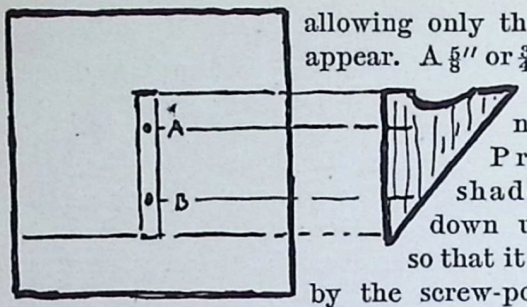


Fig. 20

allowing only the points to appear. A $\frac{5}{8}$″ or $\frac{3}{4}$″ flat screw will be needed here. Press the shadow-piece down upon them, so that it is indented by the screw-points, as in Fig. 21. This shows you exactly where to bore the holes, and it only remains to fit the shadow-piece in place and set the screws to their heads.

Next prove that your shadow-piece stands square with the base by using the try-square. Now finish with a light stain or a coat of white shellac, which may be obtained at any paint-store.

The dial must be set exactly level upon a post, garden wall, or porch where it will receive the sun from morning to night. You may either screw it down, or mark its place and set it out only in sunny weather.

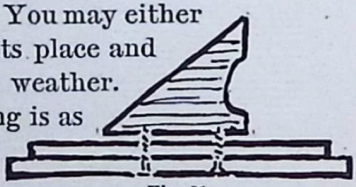


Fig. 21

The method of adjusting is as follows: At the precise second of noon, standard

time, turn the dial so that the shadow of the gnonom shall fall exactly between the two lines *M*, *M'*, Fig. 17,—that is, the hour marked XII,—and fix it in position. Watch it for several days to verify the time, and your dial will continue to give correct solar time throughout the year.

A sun-dial nowadays is not a necessity in most

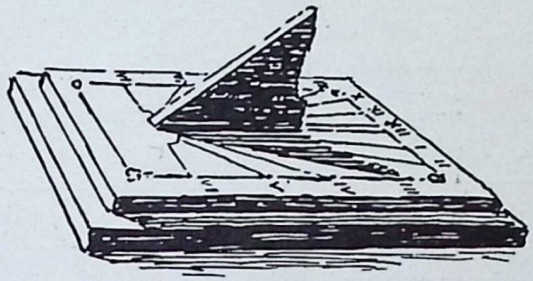


Fig. 22

places, but it may be useful in remote country districts to regulate the clocks.

A more permanent one may be made of brass or copper; but the little wooden one, if carefully made, will do good service.

PROBLEM III—PICTURE-FRAME

This frame for photographs or small pictures may be constructed to stand upon a table or mantel as

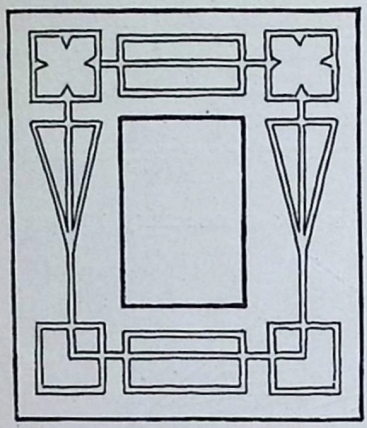


Fig. 23

here given, or it may be made to hang upon the wall, in which case the standards are omitted. The best frame will be that one which is designed with reference to a special picture.

Cut the stock of $\frac{1}{4}''$ or $\frac{3}{16}''$ basswood to $\frac{3}{8}''$ wider and $\frac{1}{4}''$ longer than the finished design. The pattern, of course, should first be designed upon paper, as in the previous problems.

Square to the dimensions given in Fig. 24, working in the regular way and proving with try-square and rule. The best method of doing this is always to square one side, then the opposite; then one end, and the opposite.

Measure $1\frac{5}{8}''$ from the outer edge all around, and then $\frac{1}{8}''$ inside that, as in Fig. 24.

This inner square is to aid in cutting out the center, and should have a hole bored in each corner.

The holes minimize the danger of splitting and of cutting over the limiting line *b*. They also enable you to cut from both sides and thus penetrate the wood more quickly.

Trim the wood down exactly to the line *b*, taking care to keep your cut across the grain deeper than your cut with the grain, else there will be great danger of splitting out.

Upon another piece of wood lay out and cut two pieces like Fig. 26, so that the edge *a* is perfectly square.

You will now need three short pieces $\frac{3}{8}''$ wide by $3\frac{3}{16}''$ long, and squared carefully, as in *a*, *a*, *a*, Fig. 25, and one piece $\frac{3}{8}'' \times 2\frac{7}{8}''$ like *b*, Fig. 25.

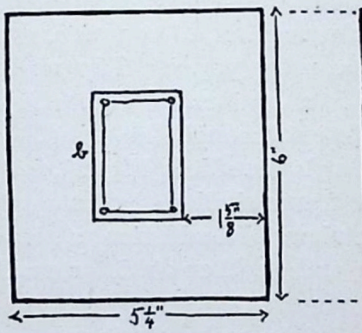


Fig. 24

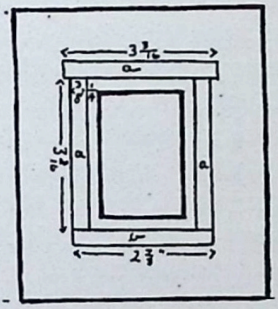


Fig. 25

Upon the back of your frame draw a line just $\frac{1}{4}''$ from the opening and all around it, as shown in Fig. 25.

Procure some small screws not greater than $\frac{1}{8}''$ diameter, and first boring holes with the brad-awl $\frac{1}{4}''$ from the ends of the strip-pieces, as in Fig. 27, back view, set the screws in with their points just appearing, as before described. Prepare all pieces in this way, pressing them upon the frame and thus indicating where the screws will set in to the back.

Having heated the glue, prepare a small chip to be used as a spreader. The chip is better than a brush, because it spreads the glue evenly and thinly and may be thrown away after using.

Spread all pieces, and place and set in the screws.

At this point it will be safe to carve the decoration upon the front of frame, first, of course, transferring your lines with carbon paper. The width and depth of the cuts is a matter of choice, but care must be taken not to cut through the wood.

In attaching the standards the side *a*, Fig. 26, is, of course, glued so that the frame shall set at an angle as shown in Fig. 27, side view. In addition, a screw should be inserted at *c* and another at *d*, or small brads would do in these places.

The picture is inserted in the rectangle formed by

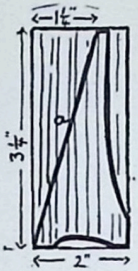
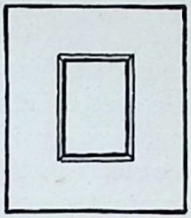


Fig. 26



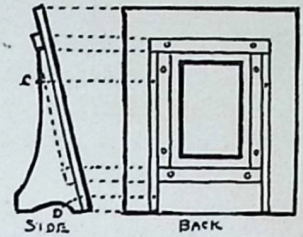


Fig. 27

these back pieces, and is held in place by pins or brads at the sides.

For another method of applying the design, see chapter on PYROGRAPHY.

In the matter of color, some combination of brown, red, and green toned to a unity would be satisfactory here; say a tone of burnt umber over all, with the conventionalized leaf touched in with pure green and the blossom pure red. (See Fig. 23.)

The principle of harmony in the character of the decoration and the outline form is here illustrated: a geometric rendering of a flower which repeats the square corners and angles of the frame.

Although this principle may be carried to the point of monotony, it is in general a safe one to follow.

PROBLEM IV—ENVELOP-HOLDER

Of the many articles that can be made from thin wood with the knife, I have selected this little object as one to be developed here, because it has proved very useful and can easily be made quite ornamental.

Five pieces are necessary in its construction, as shown in the side and end views, Fig. 29.

The stock used is $\frac{1}{4}''$ clear basswood. Cut and square up carefully the side pieces to the dimensions given, $3'' \times 5''$. The pattern is made by folding and cutting as described in the making of the calendar-back.

After cutting both sides, place them together and trim so as exactly to match each other. The lower edge, *a*, must be accurately squared to insure the vertical set of the sides.

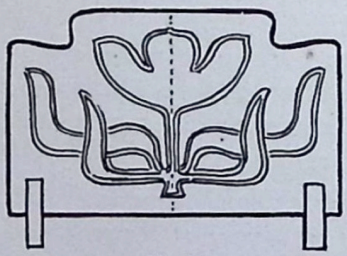


Fig. 28

The bottom piece is cut to exactly $2'' \times 5''$. In this it is important that the long edges be quite true.

Now upon the paper pattern place a point $\frac{1}{2}''$ from the bottom and $\frac{1}{2}''$

from the end, as in Fig. 29, and draw one half the design here given, or any design not too difficult to carve

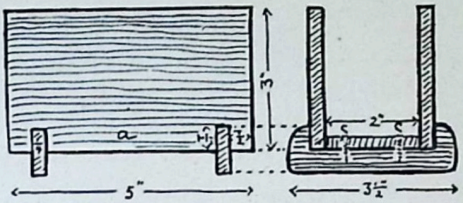


Fig. 29

and that will fit the space well. Your experience in carving up to this point will enable you to judge in this matter.

One half the design being drawn, complete it by folding on the center and rubbing over. Strengthen all the lines with a clear black pencil and transfer the whole to the wood by rubbing over the back of the whole design.

Carve the design upon both side pieces.

For an object of this kind a symmetrical design is better than an irregular pattern, and indeed this is true in the majority of objects treated in this book.

Take the bottom piece and, placing it edge down upon the side piece, as shown in Fig. 30, draw a line close along the wood. At the points *a*, *b* make holes through the side and insert ½″ brads. These pieces —sides and bottom—are then glued and nailed in the manner described in the preceding article on the

frame. The glue which oozes out around the edges must be scraped away while it is still wet; a bit of the basswood will do this very nicely. In the matter of gluing, it is better to have over-much than over-little, and therefore the oozing out around edges is a good sign.

The two standards or legs are cut from the same $\frac{1}{4}''$ stock, the piece being first squared to $3\frac{1}{2}''$ x $1''$ (Fig. 31).

Find the center of this piece and lay off the width of your case from the center on both sides. Fig. 31 shows the measurements of this piece, and Fig. 29, end view, the ultimate shape.

The notch must be carefully cut down to fit the body of the holder. Keep trying the two pieces to avoid cutting too wide. Lastly, the corners are rounded off smooth and all parts finished with sandpaper.

Brads or screws are inserted at *c*, *c*, Fig. 29, the

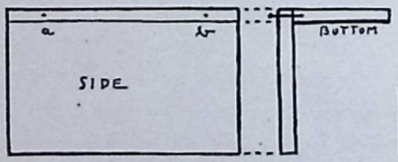


Fig. 30

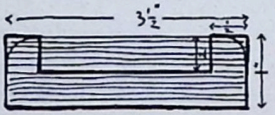


Fig. 31

edges of the legs are covered with glue and the whole put together.

The staining and waxing are done as before described.

In comparing the design given in Fig. 28 with that of the frame or the calendar-back, you will note the heavier curves of the tulip harmonizing with the outer form. All spaces are of necessity kept large and simple. A little stronger group of colors may be used in this article, giving to the whole a greater aspect of solidity—we will say a dull green background, a bright green leaf, and a full orange-blossom.

PROBLEM V—PENCIL-BOX

The length of the average pencil is about 7″, but in order that our box may be available for pens we will make the inside measurements 8½″. The stock will be $\frac{3}{16}$″ thick, and we must allow a little margin on each end, so the side pieces will need to be each 9″ long. As the height is to be 1½″ exactly, we will cut stock for the sides 9″ x 1¾″. There will be two pieces of these dimensions. The width inside is to be 2″, therefore the ends must be cut 2½″ x 1¾″. The grain will in every case run the long way.

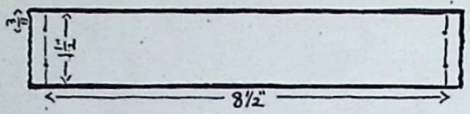


Fig. 32

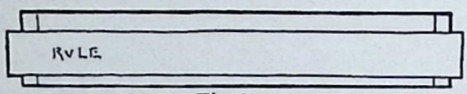


Fig. 33

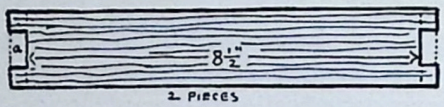


Fig. 34

Square up the sides and ends so that all pieces when placed together will prove absolutely true on their long edges. Do not at this point square the ends, for it will be labor wasted.

The joint used in this construction is called a mortise and tenon, consisting of *a*, the mortise, and *b*, the tenon, Figs. 34, 35.

The mortise is cut in the side and the tenon upon the end, and we will cut out the mortise as follows: The distance between the cuts of the mortise, Fig. 34, is the inside measure of the box, $8\frac{1}{2}''$. This distance must be carefully measured so as to allow equal distances on the ends (about $\frac{1}{4}''$).

Having squared the lines upon one piece, Fig. 32, place both sides together and mark the exact length upon the second piece.

Both for looks and for construction strength it is better to have the width of the mortise about one half the width of the side, so we shall measure $\frac{3}{8}''$ from the side on each end and draw lines for the mortise as shown in Figs. 32 and 33.

All four ends being accurately laid out upon the wood, we shall cut the mortise after the method demonstrated in Fig. 36.

Starting a small vertical cut at *a*, Fig. 36, cut in obliquely to meet it, then on the other side, and so on gradually cutting down to the line. All four mortises should be trimmed to fit exactly before proceeding with the tenons.

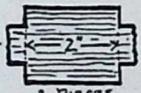


Fig. 35

These last are laid out on the end pieces in exactly the same manner and to the same size as the mortises, the distance between cuts being 2″, which is the width of the box (Fig. 35).

Fig. 36

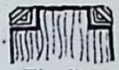


Fig. 37

Do not fall into the easy mistake of cutting a mortise on all four pieces, or of cutting

Fig. 38

Fig. 39

a mortise on one end and a tenon upon the other.

In the tenon the corners are first trimmed, as in Fig. 37, then the wood carefully notched out to the line.

As you approach the line, however, keep trying

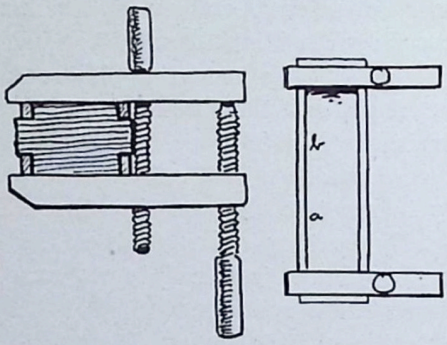


Fig. 40

the tenon, to make sure of a tight fit. When you have secured such a fit, mark that tenon and its corresponding mortise 1, 1, and proceed with the others, 2, 2, etc.

They should fit snugly, but not so tight as to endanger splitting. On the other hand, there should be no gaps or angles between the fitted parts, so you

will readily understand why this joint-making is the most delicate work we have yet attempted with the knife, and why it is placed in the last problem of this chapter.

All work here should be done with the knife-point, which must be kept very sharp, and any attempt to sandpaper out the corners will end in rounding them and spoiling the appearance of the joint.

This brings us to a point where it will be necessary to use the hand-screws (Fig. 40). They are at first puzzling little tools, and it is difficult to explain their use on paper. If you can get some one familiar with them, as a carpenter or furniture maker, to explain their adjustment and use, that is the best way.

The jaws are opened or closed by holding the shorter handle in the left hand; then, grasping the longer one in the right hand, turn the whole tool about upon the shorter as a pivot.

Two of these tools should be adjusted to the height of your frame, so that they may be slipped on quickly.

All parts of the frame which are to come in contact must be covered with glue and the whole frame fitted together with the hand-screws adjusted as in

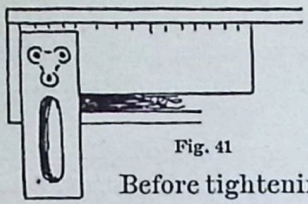


Fig. 41

Fig. 40. They are placed at either end, to insure more pressure upon the joint. The screw is set down firmly by turning the longer handle. Before tightening finally, true up the corners inside in the manner shown in Fig. 41. It is essential that at the final setting the screws should grip evenly along the whole length of the jaw (Fig. 40).

Remove the surplus glue, and leave the frame in the screws for ten or twelve hours.

While waiting for the glue to set, proceed with the cutting of the cover and bottom piece. They are both squared to the same size—that is, to project $\frac{3}{16}''$ beyond the frame upon all sides. If your measurements have been accurate, $2\frac{3}{4}'' \times 9\frac{1}{8}''$ will be the dimensions required for these pieces.

A bevel or slanting edge is cut upon the upper sides of both pieces. A line is run all around $\frac{1}{8}''$ upon the top and upon the edge, and the wood cut away to this. This is called sometimes a bevel and sometimes a chamfer.

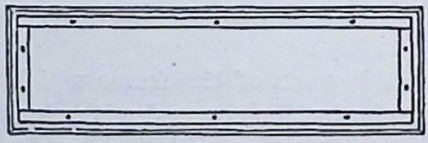


Fig. 42

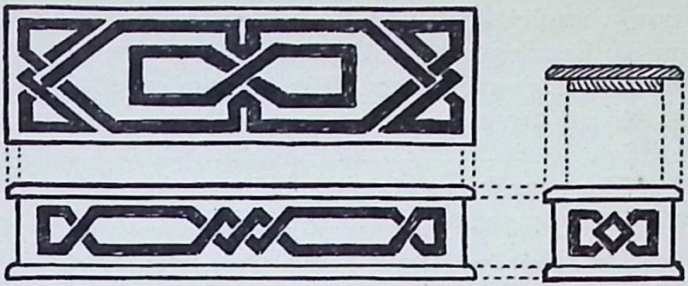


Fig. 43

To complete the cover, cut a third piece, which shall measure 2″ x 8½″, or just small enough to slip easily into the box frame. See section view, Fig. 43.

When the glue has become thoroughly dry, take off the hand-screws and trim away the projecting ends of the wood. Cut inward, or toward the center of the joint, as is indicated by the arrows in Figs. 38, 39. This cutting inward is to avoid splitting of the sides, a result which would inevitably follow cutting from the center outward.

After these joints have been cut nearly down, finish by sandpapering upon a smooth block covered with 00 sandpaper. This answers the double purpose of cleaning and smoothing the wood.

As the more delicate parts of the construction are

now completed, it will be better to decorate the whole before gluing on the bottom.

The design given here (Fig. 43) is adapted to both knife-carving and pyrography, although, from its straight lines, it is best for the former method.

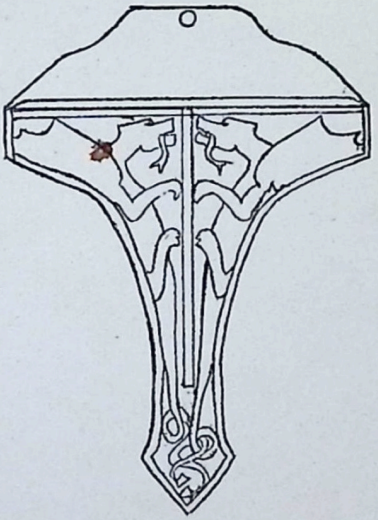
Place your frame upon the bottom piece in such a way as to leave an even margin all around, and make a light pencil-line close against the sides to denote their thickness.

Make points for brads or very thin screws, as indicated in Fig. 42. Cover the edges with glue, and nail or screw on the bottom. It will not be necessary to set this in the hand-screws, for the brads or small screws will hold the pieces while they dry. The danger in using both brads and small screws in thin wood is of two kinds: that of splitting, a danger which may be avoided by boring small holes first; and that of driving them at an angle so that they come out through the sides. It requires great care to avoid this latter catastrophe.

The piece for the under side of the cover may be glued on now. First measure, and very carefully mark where it should be placed upon the cover. Then spread thoroughly with glue, and clamp solidly with the hand-screws.

Let us review the danger-points in this problem. They are, first, cutting the joints loosely, or forcing them too tightly together and splitting the sides; second, driving the nails or screws out through the sides; third, gluing the bottom, sides, or cover askew.

The box is finally thoroughly sandpapered, and stained and waxed.



CHAPTER III

PYROGRAPHY

Design for a Wooden Box

Design for a Picture-frame

Design for a Mirror-back

Design for a Chest

CHAPTER III

PYROGRAPHY

PYROGRAPHY, or fire-etching, is the art of burning a design upon wood or leather by means of a red-hot point.

It has been remarkably popular during the past few years, because it is an art presenting few difficulties to the beginner and pleasing results may be quickly obtained.

Although largely used upon leather, I think the best results with this medium are to be had from wood. Indeed, it is commonly spoken of as "burnt wood-work." It naturally follows the chapter on wood-working, and the objects made with the knife may be decorated in this manner; most of the designs given in the previous chapters may be treated by the pyrography-point.

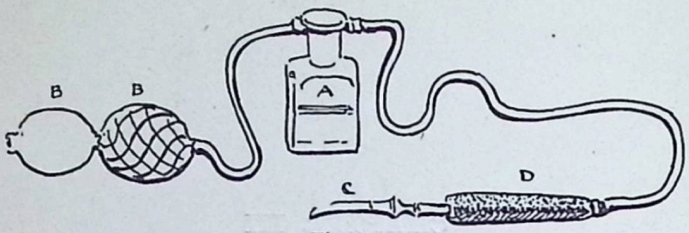


Fig. 1

So few difficulties arise in learning to handle the tool that it will hardly be necessary to devote as much space to the subject as I have found necessary in the matter of wood- or metal-work; a few suggestions and a start in the right direction will enable one to go on and work out a mastery of this medium.

Let me further say that there is no method of decoration that has been more abused. Various portraits, pictures, etc., have been caught up haphazard and applied to all sorts of objects, without regard to fitness or harmony in any sense.

One should ever keep before one the distinction between a picture and a decoration, and remember that the latter is a good decoration only when it is carefully considered in its relation to the object upon which it is placed, harmonious in idea, in line, and in color-motive. You will discover that pyrography

has its own particular beauties of expression,—characteristics which nothing can usurp,—and let us be content to limit its expression to these.

A fairly good machine or set may be purchased for five dollars of any art-dealer or large department-store. Printed instructions are supplied with each set, and the sales-clerk is usually able and willing to explain the method of working.

The principle of operating is this: A glass bottle is partly filled with benzine (*A*, Fig. 1). This is connected by a rubber tube with a bulb or bellows *B*, *B*, and by another tube with a hollow aluminium point *C*, surrounded by a cork handle *D* to protect the hand from the heat and to furnish a good grip. In addition, there is a small alcohol-lamp for heating the point.

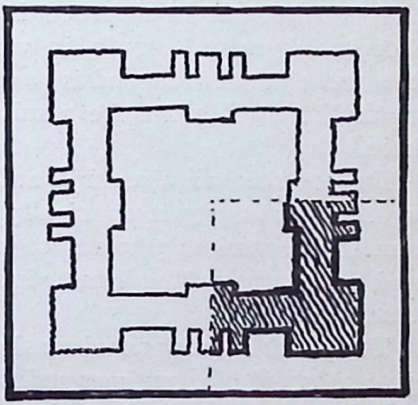


Fig. 2

First heat the point *C* to a red heat over the flame of the alcohol-

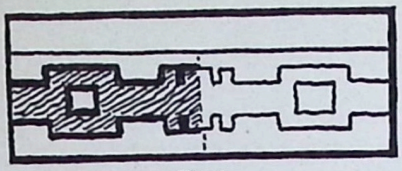


Fig. 3

lamp. Then, by squeezing the first bulb *B* with the left hand, air is forced into the second bulb *B*, which acts as a reservoir, and from this it passes to the benzine-bottle *A*, where it forces the gas into the aluminium point, which is thereby fed and kept hot.

The rest is simply a matter of drawing, lightly or heavily, with the hot point upon the wood.

There are two tendencies with the beginner. The first is to become so absorbed in the point that one forgets to press the bulb, in which case the point becomes cold. The second is to rest the heated point upon the wood, with the result of burning a deep hole.

But one soon acquires skill and facility in keeping up the air supply mechanically, very much as one almost unconsciously learns to ride a bicycle, etc.; and the control of the burner is acquired with equal readiness.

The point is constructed as shown in Fig. 1, *C*, to give a flat side for surfaces and an edge for lines.

Points of various sizes and shapes may be purchased,

but, as they are rather expensive, I would advise the use of one point only for a time.

A fine-grained wood is the best for burning. Basswood and whitewood are commonly used.

A great variety of articles for decoration may be purchased at any art- or department-store—anything from a napkin-ring to a piano-stool and a bogus wooden tankard. The stamped designs purchasable at these places are usually of wretched selection, and have little or no decorative merit. It is better to avoid these and buy a blank article; then draw your own design upon it. Copy some good piece of ornament, or get some artist friend to design for you.

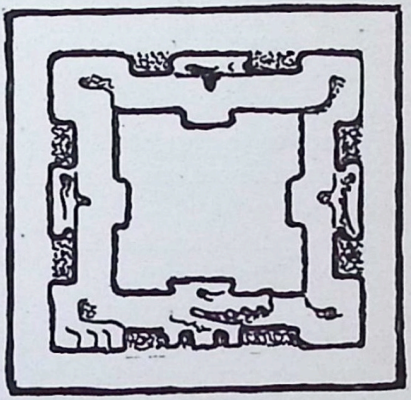


Fig. 4

Pyrography may be used very effectively with either oil- or water-color. (See Wood-working.)

Considering the designs given here, we find Fig. 2 is adapted to a square

box, and requires that one should use outline only as in the upper part, or else burn in a solid mass either with the flat or the point, as in the lower corner. Fig. 3 is the side view of the same decoration.

The animal form in Fig. 4 is adapted to fit the same box and to occupy the same space. The adaptation of this creature to the side of the box I leave to the ingenuity of the student.

This free use of the animal form is perfectly allowable in ornament, and if one cares at all for the grotesque, it is interesting to see into how many forms one may fit the snake, bird, and dragon. The Japanese are past masters in this art.

Fig. 5 shows one quarter of a circular picture-frame, so designed that the apples will fill in the space exactly. This design may be easily adapted to a larger frame by widening the outer and inner borders.

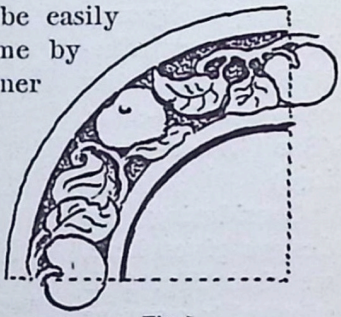


Fig. 5

I have a fondness for the apple leaf, fruit, and blossom in decoration, because it has a certain ruggedness, and lends itself to deep, rich color

in the fruit and leaf, and to delicate effects in the blossom.

In this frame the background may be burnt in a heavy, deep, stippled manner, and the fruit and leaf stained with a mottled red and green, which blend into each other as they do in nature.

The half of a mirror-back (Fig. 6) is illustrative of the same principle of line harmony, and may be appropriately finished with a coat of wax over the rich brown burning.

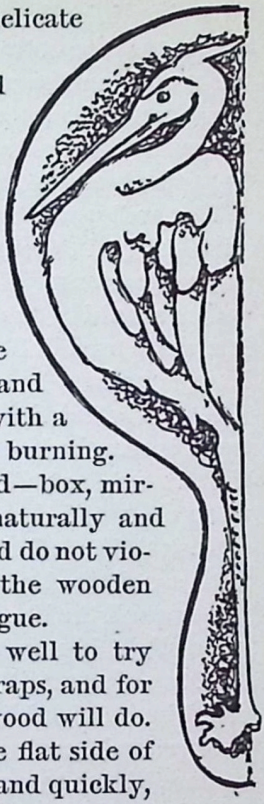


Fig. 6

The three objects here treated—box, mirror, and frame—are articles naturally and consistently made from wood, and do not violate a sense of fitness, as do the wooden tankards and candlesticks in vogue.

As in the other crafts, it is well to try some preliminary work upon scraps, and for this purpose any clear, smooth wood will do.

Try the effect of dragging the flat side of the tool across the wood lightly and quickly, and again heavily and slowly. Experiment

with fine light lines and deeply sunken lines. Other effects may be obtained by stippling or dotting with the point, and so on. With the flat, the edge, and the point of one tool, and the infinite variety of pressure that the hand is capable of, you will be able to produce almost any effect of line or background.

You will probably find that in burning straight with the grain there is a spasmodic tendency to hitch as you go along, producing a broken, spotty effect.

One should at first try to overcome this; but later it may be used deliberately to produce certain heavy backgrounds.

A characteristic effect of pyrography is that the wood is scorched on both sides of the line burned, so that an outline will be much heavier when executed upon the wood than in the design on paper.

To get the effect upon paper, draw your design with a soft lead-pencil or a crayon-point, and then rub over all the lines lightly with your finger, producing a slight blur, which will resemble the burnt line.

I have always felt that best results with this medium could be obtained by rather rich and heavy line and background burning. Yet on a small object one must be careful not to overdo this to the degree of making the ornament too conspicuous.

Many very delicate portraits have been burnt upon wood by this means, but the danger here is in trying to imitate laboriously effects much better left for the brush.

To return to the designs. The easiest method of

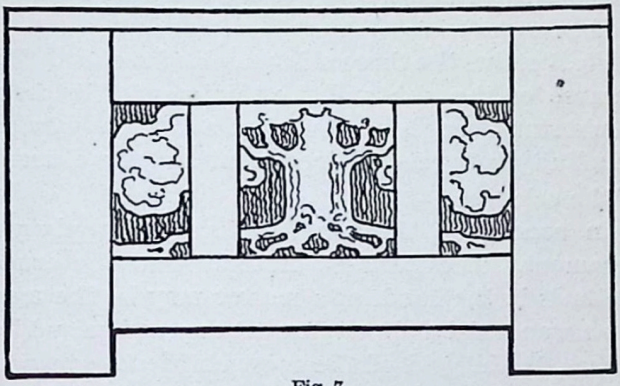


Fig. 7

reproducing is to enlarge one section, such as one quarter of the picture-frame (Fig. 5), or the box design (Fig. 2), then pin this to the object and transfer to the three other sections by carbon-paper. The pin-points should be put through some line of the design, where they will be covered with subsequent burning.

The apple design is a repeat, in all of its lines, of the outline of the frame which it decorates. This is also true of the box ornament.

The apple design applied to the box might be pleasing, but would not be as harmonious, while the same criticism would apply to the box design adapted to the frame.

Fig. 7 shows the three side-panels of a chest. This, because of the size and the thickness of its frame, would stand very heavy burning, and there would be an affinity between this treatment and the character of the oak-tree.

In conclusion, think well before you apply your ornament. The meanest material and the crudest methods in the hands of a master may be the means for a wonderful and priceless art expression ; while a piece of solid gold of the most elaborate workmanship, if it be poor and commonplace in design, is worth only the intrinsic value of the gold.

CHAPTER IV

SHEET-METAL WORK

PROBLEM I — A Small Copper Tray
PROBLEM II — A Brass Sconce
PROBLEM III — A Brass Lamp- or Candle-shade
PROBLEM IV — Lanterns
PROBLEM V — Letter-box
PROBLEM VI — Copper Bowl

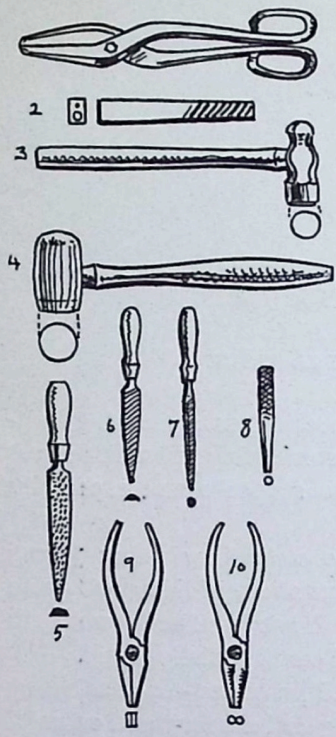
CHAPTER IV

SHEET-METAL WORK

WORKING in sheet-metal has something substantial about it—something masculine and enduring which appeals to students and especially to boys.

It is also interesting to note how many young women have begun a serious study of this craft quite recently, and that many have produced work in brass, copper, and silver of much artistic merit.

While the more advanced processes—such as heavy forming, delicate embossing and chasing, and enameling—require an extensive outfit beyond the reach of the many, a great deal may be accomplished with a simple equipment at a comparatively low cost.



This chapter is written to aid those who, with little or no technical skill and small purses, would like to produce something practical in this craft.

Tools and Equipment.— While not absolutely necessary, a regular work-bench is very desirable in this work. You may obtain one, such as is sold to manual training-schools, for about $6.

This will be equipped with a wooden vise. In place of the bench, a heavy table, shelf, or window-ledge will do.

Without the bench it will be necessary to purchase a metal vise that may be attached to the shelf or table.

Following is a list of the necessary tools, with their approximate cost:

1. Small pair of metal shears	$0.30
2. Small rivet set	.20
3. Ball-peen hammer, medium size	.40
4. Hard-wood mallet, length of head 6 in., one end ground to a hemisphere	.25
5. Medium wood rasp	.15
6. Medium half-round file	.15
7. Rat-tail file	.20
8. Nail set	.10
9. Flat pliers	.20
10. Round pliers	.20

Necessary materials are:

Several sheets of fine emery-paper	.05
20-, 10-, and 6-penny wire nails.	
Hard-wood block, oak or hickory, surfaces squared to 12″ × 4″ × 3″.	
Soft-wood block, surfaces squared free from knots, 9″ × 12″ × 2″	
Soft sheet-copper, gage 21 per lb.	.23
Soft sheet-brass, gage 24 per lb.	.20
Small block of metal, 3″ × 4″ × 1″, to be used for riveting. This sometimes may be procured from the scraps of an iron-foundry or stove-store.	
Small copper rivets per lb.	.40

PROBLEM I—A SMALL COPPER TRAY

The making of a small copper tray constitutes a simple problem of hammering and bending. The first consideration must be for the design,

Take a sheet of paper large enough to allow for a good margin all around, and draw the diagram Fig. 1 according to measurements given, being very careful to get the lines at right angles. This can best be done upon the drawing-board with T-square and triangles.

Upon one side of the line A–B, within the smallest rectangle draw a simple radiating pattern that will repeat well as a symmetrical design. It is necessary to draw only one half, as shown in Fig. 2.

Work in a single clear, clean line, remembering that there is a difference between the line of a designer and that of an artist. The line of the artist

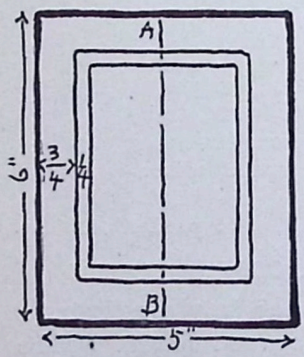


Fig. 1

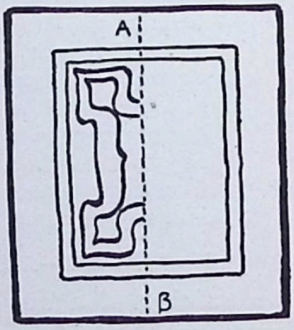


Fig. 2

should be free and sketchy, but in this work a definite line is best.

The method of folding and transferring the pattern by rubbing on the back has already been explained in THIN WOOD-WORKING.

Cut the paper upon the lines marked heavily in Fig. 3, leaving a flap at the top.

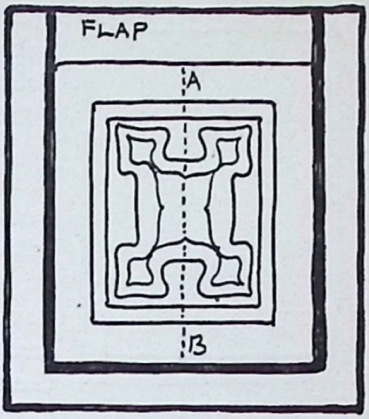


Fig. 3

We are now ready for the metal. Cut a piece of copper to exactly 6″ × 7″, marking it out carefully and cutting near the joint of the shears. If this is done each time metal is cut, it will prove the easier way.

It will probably be necessary to smooth the metal by laying it upon a hard-wood block and striking it squarely with another block. Next round off the corners slightly, as shown in Fig. 4, and draw a pencil-line $\frac{1}{2}$″ from the edge upon all sides. In the middle of the border thus formed punch holes as indicated in Fig. 4.

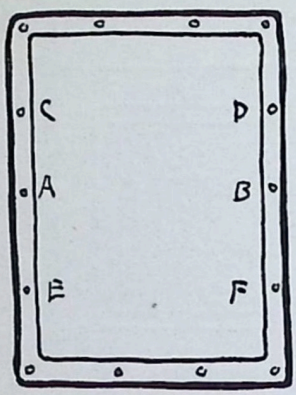


Fig. 4

More holes than this are not necessary; fewer will not hold the metal firmly.

The metal must next be screwed to the soft-wood block. Place it at about the center, and start the screws with the hammer in the middle holes A–B. Set them down to the head with the screw-driver, being sure that the metal lies flat between, then set in C-D, E-F, and so on.

Should we set in the corners first, the metal might bend up in the middle and when we began to stamp would vibrate under the tool.

Take care, then, that the metal lies as flat as possible between each screw-head.

Now adjust the design as shown in Fig. 5, so that the paper comes well within the screw-heads.

Put thumb-tacks through the flap at the top of the paper into the wood, leaving three edges of the paper loose.

Slip a piece of carbon-paper beneath, and transfer by going over all lines with a hard pencil.

You may, by this arrangement, lift the paper to watch the transfer of lines, and the tacks at the top will hold the design so that it will fall back in place.

As you work over the metal the passage of the hand is likely to erase the carbon-lines; therefore it will be necessary to scratch in or engrave them.

Take a 6-penny wire nail and, setting it in the vise between two scraps of soft wood, file it to a conical point with the flat side of the half-round file (Fig. 6).

The soft-wood scraps answer two purposes: they clutch the nail more firmly and, if the faces of the vise are wood, prevent scarring the vise. File on the forward stroke, taking a long and steady rather than a short, jerky movement.

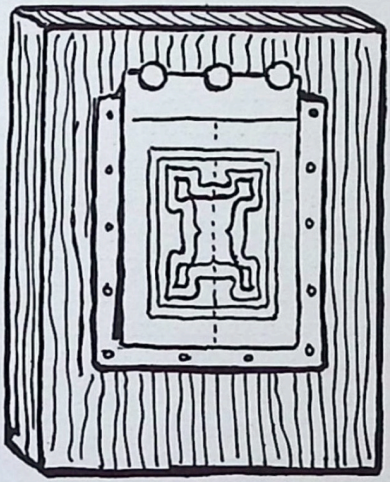


Fig. 5

With this little scratch-awl held near the point, go over your carbon-lines and

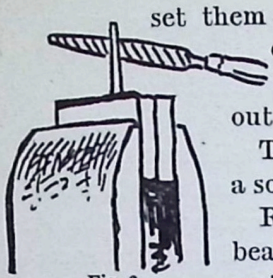


Fig. 6

set them in lightly, thus obviating all danger of erasing the lines.

The design is to be brought out by stamping the background. This process raises the design in a sort of embossing or repoussé.

Repoussé in its proper sense is beating up from the back, and with metal-workers in a thoroughly equipped shop this is done upon a bed of soft pitch.

But a low relief and a very interesting contrast of texture may be obtained by using a piece of clear, soft pine for a bed.

For this work two more tools will be necessary, both of which can be readily made by the student. File a 10-penny nail straight across the point so as to produce a small square stamp (Fig. 7, *a*). Then file a 20-penny nail to the shape indicated in Fig. 7, *b*. Notice that this last tool is not sharp on the edge, but has a slight thickness like the blade of a screw-driver. If sharp the tool would be likely to perforate the metal.

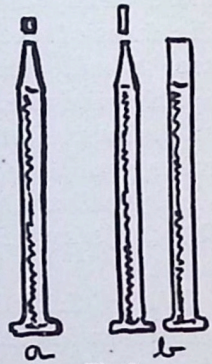


Fig. 7

Both tools should be carefully smoothed with emery-paper so as to get rid of any sharp or cutting edges. The process of filing the tool heats it and takes out the temper. To replace this, heat the tool to a red heat through the point and then plunge it into cold water at once.

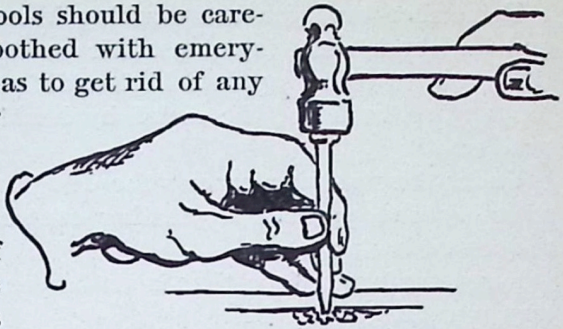


Fig. 8

Various sizes of tool steel may be purchased, and metal-workers use this for making the many tools needed for fine chasing. But in our simple work I find that wire nails answer very well, and they certainly have the advantage of being cheap and easily obtainable. The square-ended stamping-tool is held in a vertical position in the left hand and struck squarely with the hammer held in the right hand (Fig. 8). The whole background is covered in this manner, care being taken not to punch too deeply and to keep the stamping of an even depth throughout.

Remember that you are working in cold metal, and that high relief is not possible or desirable in this work. Beating up into high relief necessitates frequent softening of the metal by heating or annealing.

Under this stamping process the design rounds up smoothly and presents a pleasing contrast to the roughened background.

For stamping a piece that is no larger than this tray, a small stamp is best.

A little preliminary practice, to accustom the hand muscles to the tool, will be necessary.

This simple method is easily learned, and good results can be got by young boys.

The second tool (b, Fig. 7) is used for accenting the edges of the background and for sharpening the lines. It should be used sparingly and only after everything possible has been done with the first tool.

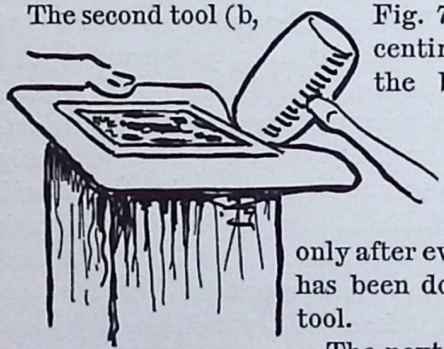


Fig. 9

The next step is to remove

the metal from the block and carefully trim off the rim containing screw-holes.

Upon the back draw a border line $\frac{3}{4}''$ from the edge, as was done upon the face in Fig. 1.

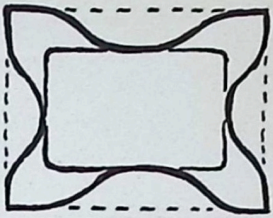


Fig. 10

Place the hard-wood block in the vise in such a position that the $\frac{3}{4}''$ line shall come just over the angle of the block. The embossed or raised side will be next the block. Then with the round end of the mallet beat the center of the side over the edge of the block as in Fig. 9.

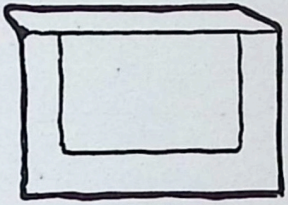


Fig. 11

The following general rule should be observed in this work: Never strike the metal *with* metal, or *upon* metal when it can be avoided. The use of a wooden mallet upon a wooden block keeps the metal soft and pliable; whereas a hammer would rapidly stiffen it.

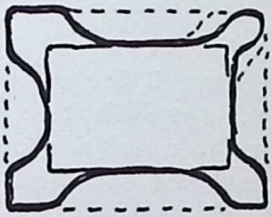


Fig. 12

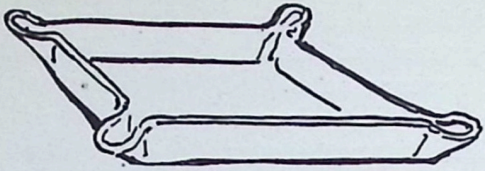


Fig. 13

The work will now resemble Fig. 10. Should you beat one side away to the corner, as in Fig. 11, the tray would be spoiled in its appearance and it would be impossible to get a nicely rounded corner.

After each side has been beaten down in the middle, as in Fig. 10, work up the corner, first from one side, then from the other, so that it shall close up evenly, as in Fig. 12.

This should be done with the round end of the mallet, which will fit nicely to the curves.

Now, if the edges are rough, file them with the half-round file, using its flat side for convex curves and its round side for concave. The corners may be reached with the rat-tail file. The tray at this stage should appear like Fig. 13.

To make it more ornamental in outline, hold it as shown in Fig. 14, and beat the sides out slightly to form an even curve. The amount of this curving will be a matter of individual taste.

It is likely that the tray will not lie flat upon the table, owing to the warping caused by the stamping process. Place it upon the end of the block, as in Fig. 15, and tap with the mallet upon the stamped parts; this will gradually flatten it. By holding the mallet near its head a light blow is obtained, and by holding near the end of the handle a heavy blow is the result. Let this, with the height to which the mallet is raised, control the blow, and do not attempt to force the tool down rigidly. This applies to hammers and all tools of like construction.

Copper may be cleaned in several ways. (See for-

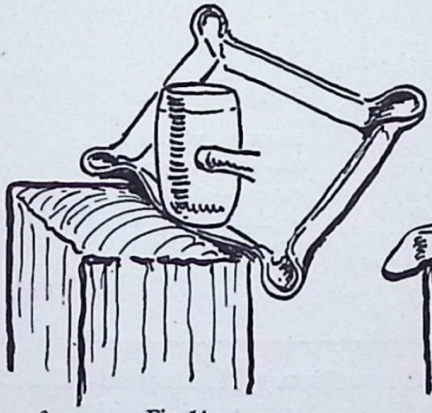


Fig. 14

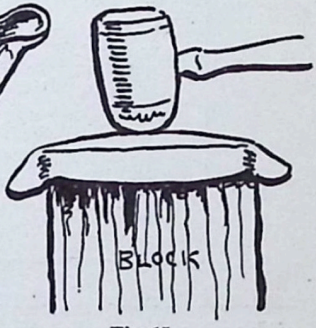
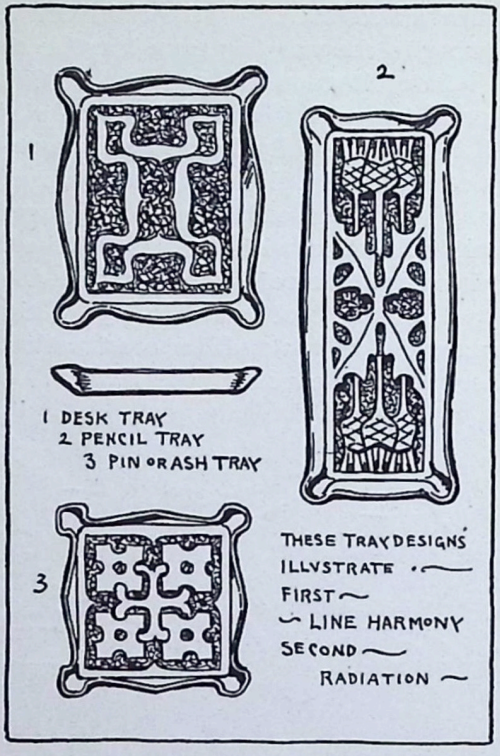


Fig. 15



mulæ at the end of this section.) It may be colored either by slowly heating or by the use of acids.

The acid coloring is more permanent, but color produced by heating slowly over a flame is very beautiful, and may be renewed as often as desired.

PROBLEM II—A BRASS SCONCE

A most interesting problem to work out in the method of the tray is a brass sconce or candle-holder, such as was used for lighting a century ago. As a room decoration these sconces make interesting bits of color by day, and give out a softly reflected light at night. They have proved a very popular problem with most students.

In preparing this design, as in all others, we must first consider constructive necessities. What is the purpose of a sconce—what its use, and what the shape and placing of its principal parts?

In Fig. 16, we have all the essential parts: the back piece, consisting of *a*, the reflector; and *e*, the border; with *d*, the hole by which to hang it; bracket *b*, composed of a lower part to attach to the back; and a shelf (see side view, Fig. 16) to hold the candle-cup, *c*, and the saucer, *s*.

All of these parts are necessary, and, however we may change their size and proportion, or vary the

lines, we must not omit any or change their relative positions.

Let me here emphasize the fact that utility is the first consideration; beauty, design, and ornament are secondary.

We must now design a sconce which shall have these parts in their proper relations, but with the element of beauty added.

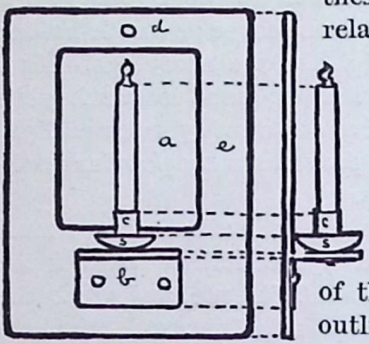


Fig. 16

Upon the paper draw a rectangle exactly 8″×11″ (Fig. 17), allowing a good margin all around, as in the tray, and on one side of the line A–B design the outline. Avoid complex curves and keep the outline simple, varying enough only to make it interesting.

It is best to make the design the full height of the space allowed, so that the reflector can accommodate a long candle; but the width of it is determined by the number of candles used, or by the taste of the individual.

A narrow border is allowed just inside the outline,

because the effect would be bad if you stamped the background quite to the edge of the metal. Between this border and the reflector, which should be kept plain, is the space allowed for ornament.

The design of the dragon, or salamander, which I have used, seems well adapted for this purpose; not only because we may take liberties with it and adapt it to almost any space, but because there is a poetic or mythologic harmony of idea with the element of fire (Fig. 18). This design, it will readily be seen, depends principally upon the dragon for its interest; while Fig. 19, a simple application of a lily form, depends fully as much upon the shape of the lower part, the bracket, etc.

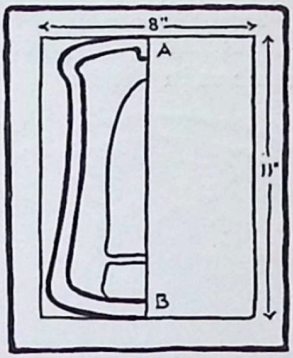


Fig. 17

Having completed one side of the drawing, fold it upon its center line and transfer the other side by rubbing, thus insuring a perfectly symmetrical pattern.

The brass, gage 21, is cut to exactly 9″×12″, or

the same size as the soft-wood block, and upon this it is screwed, observing the same care as in the tray. As the design is limited to $8'' \times 11''$, this allows $\frac{1}{2}''$ all around for the screws to be inserted.

The stamped background is sufficiently indicated in Figs. 18 and 19 by the shaded parts. A little higher relief is desirable in the sconce, but otherwise the methods are precisely the same as in the tray.

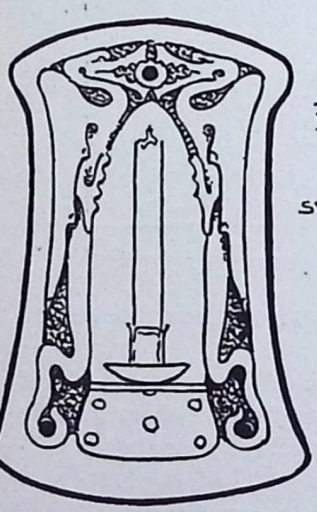


Fig. 18

SCONCE DESIGNS

TWO PART SYMMETRY

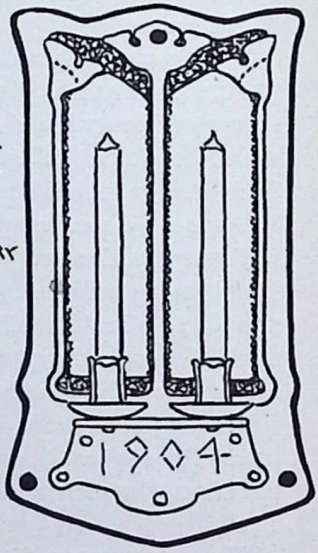


Fig. 19

This problem involves a new process in the attaching of the bracket—that is, riveting.

It also necessitates the drawing of three other patterns: the bracket or shelf, the saucer, the cup or actual holder.

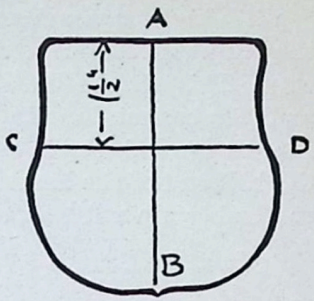


Fig. 20

For the bracket, fold a sheet of medium thick paper through the center (A–B; Fig. 20), and cross it with a horizontal, C–D.

Below C–D, on one side of A–B, design a curve for the lower piece of the bracket (*b*, Fig. 16).

Above C–D, on the same side of A–B, draw a space, as shown, $1\frac{1}{2}''$ wide. Fold on the line A–B and cut through both thicknesses, thus giving the full pattern A–D B–C.

This bracket, being for one candle only, does not need to be very wide. A bracket for two candles would require greater width to support the saucers. The part above C–D supports the candles and is bent out over the block to a right angle (see Fig. 16), and the part below C–D is riveted to the back-piece of the sconce.

With the compass describe a 2″ circle directly upon the brass, and cut this out to form the saucer or drip-cup. This should be hollowed to hold the grease, and it is easiest done in the following manner: Set the hard-wood block on end in the vise, and with the ball end of the hammer strike it repeatedly upon the end grain until an even hollow is formed, as in Fig. 21, *a*.

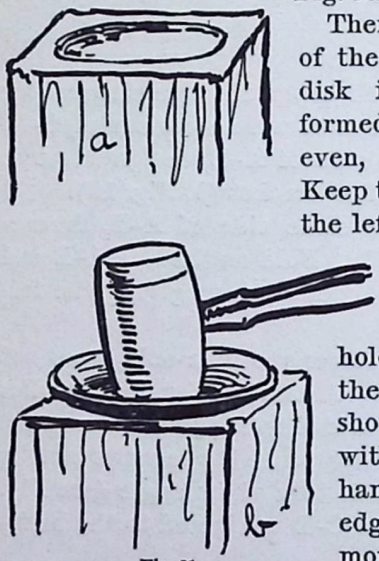


Fig. 21

Then with the round end of the mallet beat the metal disk into the curve thus formed, until it takes an even, saucer-like shape. Keep turning the metal with the left hand while you beat with the right (Fig. 21, *b*).

To finish the saucer, hold it upon the flat end of the block in the position shown in Fig. 22, beating with the round end of the hammer just within the edge to round up and give more depth (Fig. 22).

A cross-shaped pattern (Fig. 23) is convenient for the candle-holder. This may be drawn directly upon the metal, cut out, and finished smoothly on the edges with emery-paper. This will complete the necessary pieces, and at this point, before bending, they should all be thoroughly cleaned with some good metal polish. Powdered pumice or Putz Pomade does very well.

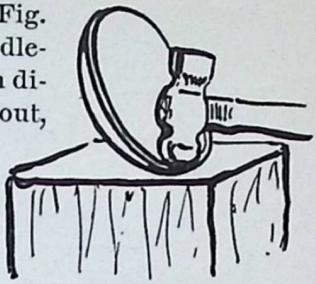


Fig. 22

The next step is to punch and rivet all pieces, and although this may seem a little difficult at first, some previous practice upon scraps of metal will enable even very young students to do a neat and strong piece of work.

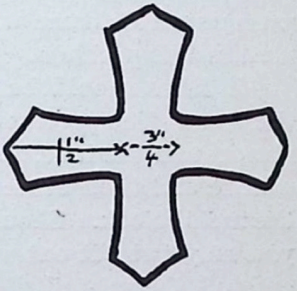


Fig. 23

In the lower part of the bracket-piece punch three holes (Fig. 24), one hole in the center of each saucer and candle-holder, and of course a corresponding hole in the upper part of the bracket, as at *a*.

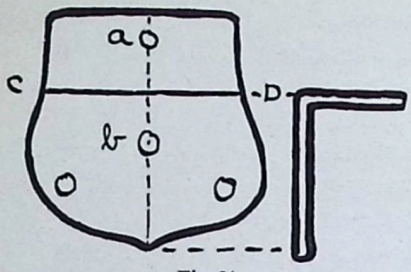


Fig. 24

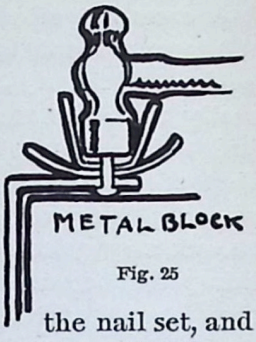


Fig. 25

This punching is done with the nail set, and upon the end of the hard-wood block; and the hammer should be used in this case as a striking tool.

Small copper rivets may be purchased for about forty cents a pound of any hardware dealer. The washers which come with the rivets are not to be used in this problem.

All holes should be punched a little larger than the rivet. The process of punching will raise a slight rim around the hole, and this rim should first be filed a little and then beaten flat with the hammer upon the metal block. Should this close the hole too much you may twist it out with the punch or the reverse end of the rat-tail file. The rivet should just slip into the hole, for if it fits too loosely that means trouble in riveting.

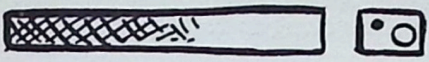
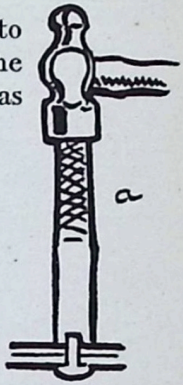


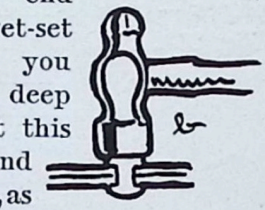
Fig. 26

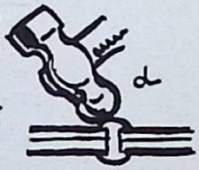
The hole *a*, Fig. 24, should be $\frac{1}{4}''$ from the edge. Bend the bracket to a right angle by setting it in the vise just to the line C–D and beating it over with the mallet.

Bend the candle-holder just enough to allow it to fit into the saucer, and set the rivet up through the three pieces, as shown in Fig. 25.



In the end of the rivet-set (Fig. 26) you will find a deep hole. Fit this over the end of the rivet, as in Fig. 27, *a*, and tap the set down so as to close the several pieces of metal well up together.





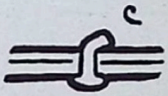


Fig. 27

The actual process of riveting is to tap the end of the rivet down squarely and evenly, spreading it, as in Fig. 27, *b*.

Notice that the rivet is not beaten off close with the surface of the metal, but some thickness is allowed for strength. The rivet spreads, thus clenching the two or more plates together. The result of not hitting it squarely is shown in Fig. 27, *c*.

Finish by tapping it on the edge as shown in Fig. 27, *d*, thus producing a rounded head.

Rivet the three pieces — candle-holder, saucer, bracket — together (Fig. 25), striking from above. Then it will be more convenient to form the holders before riveting to the back piece.

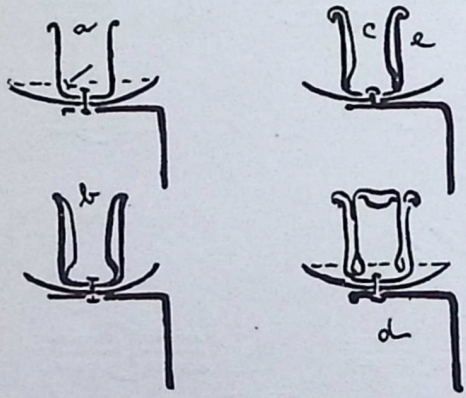


Fig. 28

Bend the holder at points indicated by arrow-heads (Fig. 28, *a*), so that the width will just take an

ordinary candle—about $\frac{3}{4}''$. This is done with the flat pliers.

Fig. 29

Next bend the edge of the sides with the round pliers (Fig. 28, *b*); then the points are rolled outward over the round pliers to resemble *c*. The finished holder is shown at *d*.

The main part *e* should be straight, or nearly so, in order to hold the candle firmly.

Rolling the points outward enables the candle to slip in easily, and the curved edges clutch it and hold it straight.

This holder may be varied by making three or only two arms. If there are but two they should be at *a* and *b*, Fig. 29.

The form of all these parts may be varied so long as they answer the use to which they will be put. Many of these slight changes will suggest themselves to students, who will thus have opportunity to bring individuality into the work.

There remains but to rivet the bracket.

Place it carefully upon the back piece and mark the center hole (Fig. 24, *b*). Punch and rivet this first; then, the others.

The files and emery-paper should be used to finish up all edges.

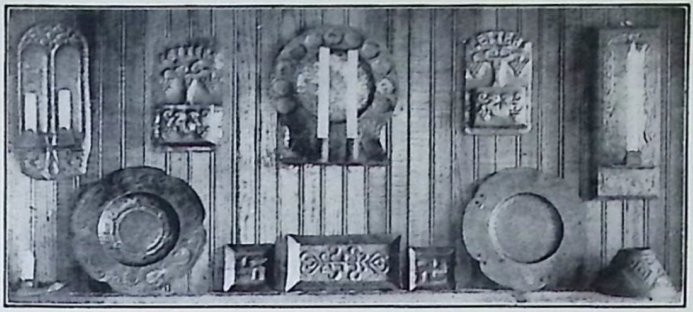
It is wonderful how much the color of the metal and the difference of stamped and smooth texture lends to the design. If the design be carefully spaced with due regard for line harmony as well, crude workmanship is no detriment, and, indeed, in the case where the grotesque animal form is used this crudeness becomes a virtue. I have only to refer my readers to the demons and gargoyles of Notre Dame to illustrate this fact.

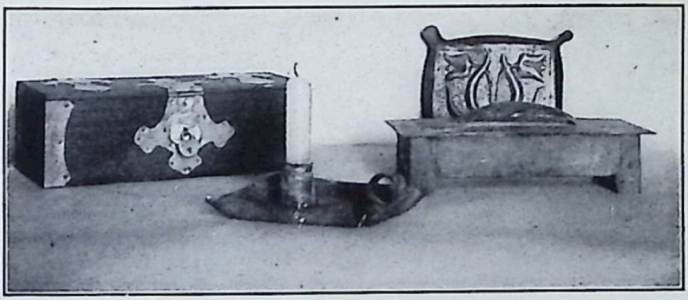
PROBLEM III—A BRASS LAMP- OR CANDLE-SHADE

The tray and the sconce have called for a rather heavy metal, but the perforated shade should be made of a somewhat thinner gage—28 or 30. (The gage or thickness of the metal decreases as the numbers increase.)

In Fig. 30 we have what appears to be a rather complex diagram, but I know of no simpler method of developing the pattern for a shade upon any given dimensions, and on analysis this method will be found really simpler than it looks.

Lay out upon paper the diameters of the larger





INTERESTING EXAMPLES OF SHEET-METAL WORK

(Designed and executed by amateurs)

and smaller circles of your proposed shade, which must be determined by the size of the lamp it is to fit. These circles are represented at A–D and B–C (Fig. 30).

Draw the diameter A–D.

Project this downward to A′–D′ and draw L–M. Project B and C to B′ and C′. From A′ draw A′–B′ any length you choose. This is the slant or profile of the shade. Prolong to O. Draw O–C′–D′ and B′–C′–A′. B′, C′, D′ is the side view of the shade; A, B, C, D is the top view.

From these must be developed the accurate pattern.

With the triangle find 30°, and bisect this, giving 15°, K, D, Fig. 30. This will be $\frac{1}{24}$ of the circumference.

With O–A′ as a radius, describe a circle (Fig. 31), and another circle from the same point with O–B′ as a radius. From any point, J, on the large circle lay off with the compass 24 equal spaces of the length of K–D (Fig. 30), and from the 24th point draw M–O (Fig. 31.)

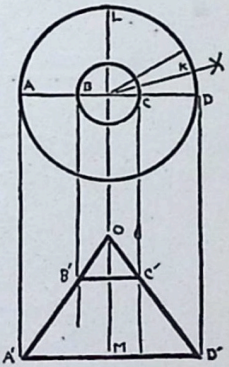
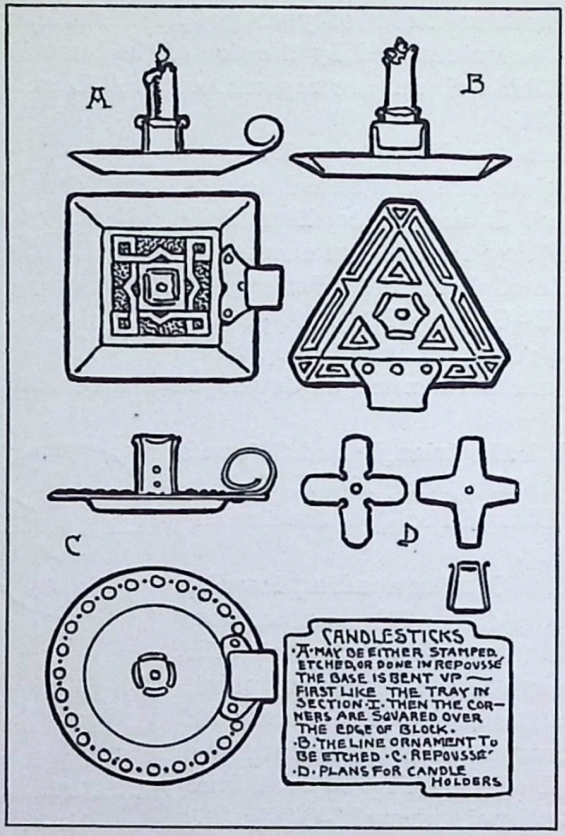


Fig. 30


A
B
C
D
CANDLESTICKS
·A· MAY BE EITHER STAMPED ETCHED OR DONE IN REPOUSSÉ THE BASE IS BENT UP — FIRST LIKE THE TRAY IN SECTION I. THEN THE CORNERS ARE SQUARED OVER THE EDGE OF BLOCK.
·B· THE LINE ORNAMENT TO BE ETCHED ·C· REPOUSSÉ
·D· PLANS FOR CANDLE MOLDERS

Add one space for a lap upon which to rivet and draw A′–B′–O. Cut out on the heavy lines, Fig. 31, and this pattern, when folded so that M coincides with J, will give the shade A–B–C–D (Fig. 30).

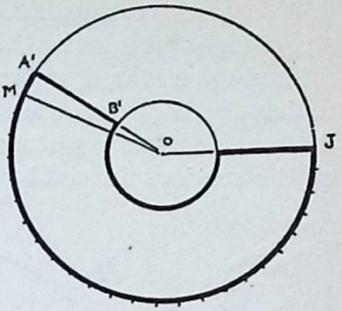


Fig. 31

With the two circles and the length of side given you may develop any shade in this manner.

In Fig. 32 is given the pattern for one side of a square shade, allowing a lap for riveting over each corner. Or a square shade may be constructed of one piece, as in Fig. 33. This last pattern wastes considerable metal and is not as strong or as ornamental as the first, but has the advantage of requiring rivets in only one place.

The circular shade could be made of four pieces by first constructing the entire diagram, as explained, and then cutting in fourths, afterward adding upon the brass a lap at every sixth space.

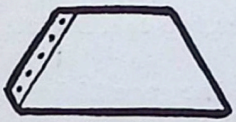


Fig. 32

Of course, patterns can be made with three, five, six, or eight faces, after the manner of Fig. 32.

Having cut the circular pattern as indicated, fold under the flap, and then fold in thirds and again double. Mark every other fold, as in Fig. 34. In one of the sections formed by this folding draw one half the design. Then bend inward on the fold A–B, and transfer by rubbing on the back—finishing one symmetrical unit. Strengthen the lines and transfer the other units by rubbing from the first.

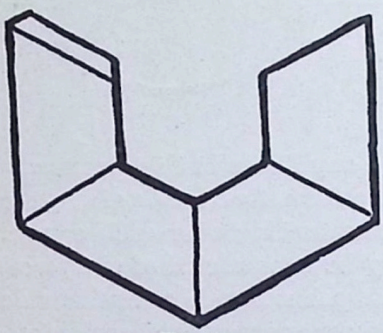


Fig. 33

Another way is to prick through the lines with a pin-point. Or draw one unit on a separate piece of paper and transfer into each space with carbon-paper.

A well-proportioned plain border, top and bottom, adds to the finish.

Glue or paste the pattern upon the gage 28 brass, and then carefully scratch a line all around the edge.

The perforating-tool is made from a wire nail by simply filing it to a long conical point, and the punching is done upon a hard-wood block.

Perforate the whole outline and background with holes of about uniform size and spread evenly over the surface. Of course it is not necessary or desirable to arrange these perforations in even rows.

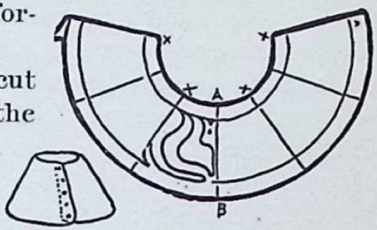


Fig. 34

The outline may be cut with a tool similar to the straight tool used in the tray, filing it to a cutting edge. If this is done, see that a sufficient space is left between each cut to prevent their uniting (Fig. 35).

The perforating finished, cut the brass along the curves. The paper pattern may be washed off with water, and it will be most convenient to remove this after the outline has been perforated, as the background can then be completed without the drawing.

File the edges and finish smoothly with emery-paper, so that if the finger is run all about the metal it will not catch anywhere.

In the flap which has been left at one end, punch

five holes for rivets. Bend the shade up as evenly as you can with the hands, rough side outward, until the ends overlap.

Mark carefully the position of the middle hole, punch and rivet it, then proceed with the others, punching and riveting one at a time.

With the hands and mallet bend and beat out the shade to an even curve, taking care not to beat hard enough to close the holes.

There is another way to fasten over the ends, but it is neither as strong nor as ornamental as riveting. For want of a better term I will call it a clutch-joint. It is made as follows: On either end of your shade leave a $\frac{1}{2}$" margin parallel to the edge. Bend

Fig. 35

this with the pli- ers or over the block, as in Fig. 36, *a*, the angles facing opposite ways. Bend them until they will hook together like *b*. Then ham- mer together on the metal block to form the joint *c*.

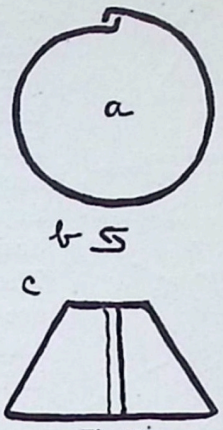


Fig. 36

There are many variations of the form, proportion, and method of perforating the shade that will surely suggest themselves to the student as he works.

A shade may be made from a single piece of metal without any joint what- ever in some- thing the same manner as the tray. One of this sort is shown in Fig. 37.

Cut out first a 12 " square, with an additional $\frac{1}{4}$" left for flaps all around. A 4 " square is next cut out of the center, except where $\frac{1}{4}$ " is allowed for flaps (Fig. 37, *a*). All edges are then filed and emery papered, and the flaps bent under with the pliers and then beaten flat. This gives a needed extra stiffness to the edges.

Next transfer and stamp the design upon the mid- dle of each side. Bend the metal upon the dotted lines with round pliers and mallet to form Fig. 37,

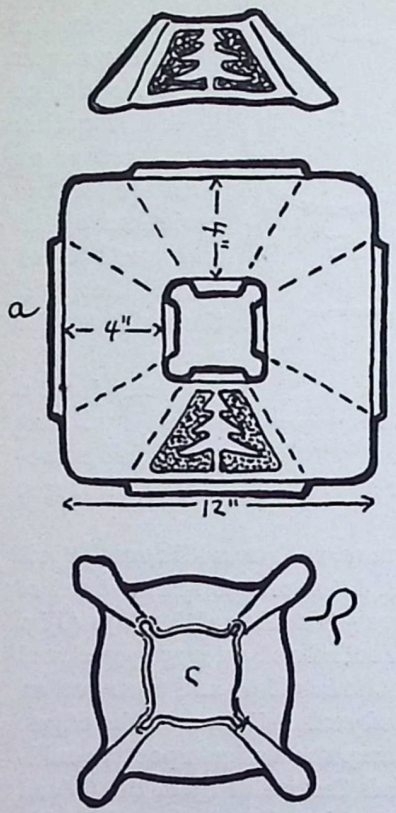


Fig. 37

c; Fig. 37, *b* showing the side view.

In Fig. 40 is illustrated another form. Four, five, or six sides are cut out as in *b*, the flaps bent under and design perforated. Then corner pieces, *a*, are cut and riveted to each piece as shown in the diagram *d*.

Or we may cut out the open spaces in the design with a straight edged tool and place colored glass behind them as shown in Fig. 40, *c*. If the glass is used, gage–21 metal will be needed in the frame to support the weight of the glass.

Any glazier will cut

the glass for this purpose.

If glass is used in the shade at Fig. 37, then the tree pattern may first be

Fig. 38

cut in four separate spaces (Fig. 38), a border allowed all around, and the background perforated.

Still another way is to eat out the open spaces with acid.

Mix the following solution:

3 parts clear water
1 part nitric acid
1 " sulphuric acid

Place this in a large earthen crock or jar, and always keep it covered, for the fumes are disagreeable and harmful.

Better keep it in some out-of-the-way place apart from the living-rooms. Cover all of the metal, except those parts which are to be eaten through, with black asphaltum varnish, spread evenly on both sides.

Allow this to harden for twelve hours, then im-

merse the metal in the acid, which will eat through the exposed parts.

Keep close watch of the work while in acid, fishing it out occasionally with a stick.

By no means allow your hand to remain in the acid, and should a few drops splatter upon the flesh, wash them off immediately. A jar or pail of clean water should be kept by the acid-tank.

The black varnish may be removed with turpentine, or by immersing in a solution of hot water and lye.

Figs. 38 and 39 show the derivation of ornamental conventional form from natural form.

The fir is one of the most symmetrical of trees.

Observe that its sharp angles harmonize well with the bent-up form of the shade upon which it is used, and that the heavier forms of the oak are more readily fitted into the obtuse angles and squarer forms of Fig. 40.

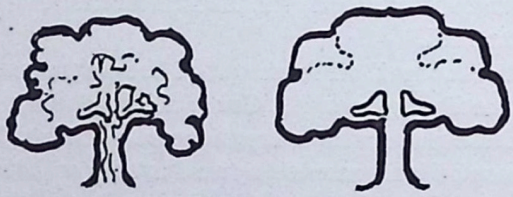


Fig. 39

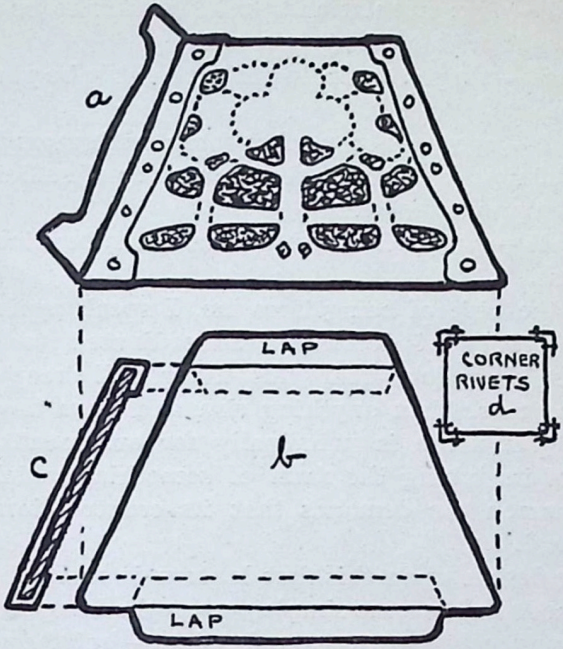


Fig. 40

PROBLEM IV—LANTERNS

In designing a lantern which shall meet the requirements of practical use the following points must be considered :

First — size: in relation to whether it is to be carried about or to be hung in a hallway.

Second — shape: according to the light to be placed within.

Third — openings or perforations: with regard to the emission of light, and to the matter of sufficient draft to prevent smoking.

Fourth — proportion and decoration subordinated to these.

At the risk of being tiresome, I speak again of the necessity of decoration subordinated to use, because I believe that this thing will keep art healthy more than anything else, and even though the object made is principally for ornament, the fact of its taking the form of something which is in common use demands that its construction be practical.

The design upon this first lantern is marked out and made in the same simple way as the lamp-shade, — by perforating with a round point, — but the planning and fitting together must be an accurate and careful piece of work, although well within the ability of a boy of fourteen.

It is to be a cylindrical lantern, something in the style of the old-fashioned watchman's lantern of

ETCHED AND PERFORATED METAL-WORK

(Chautauqua School of Arts and Crafts)

colonial days. This as well as the lamp-shade may be made of tin with good effect.

The paper used for the pattern should be tough, and of medium thickness to prevent easy wrinkling.

The proportions of this lantern should be about those given in Fig. 41. Height of cylinder 10″, diameter $5\frac{1}{3}$″, slope of roof $5\frac{1}{2}$″, with an overhang of $\frac{1}{2}$″.

Draw the front view and develop (Fig. 41), and project the circles of the roof and of the bottom.

The pattern of the top is developed as already explained in the shade, and as shown here in Fig. 43.

In the lantern we omit the opening that occurs at the top of the shade and merely develop a cone.

The exact pattern for the lantern body is obtained from the circle *c* (Fig. 41), which shows the diameter of the cylinder. This circle is divided into twenty-four equal parts, and these are spaced off along a straight line, as in Fig. 42, adding one more space for a lap for riveting. It will give you a length, in this case, of 16″ without the lap. Complete the pattern as shown in Fig. 42.

A simple geometric repeat may be used, first dividing the space into squares or diamonds and then sketching in the units.

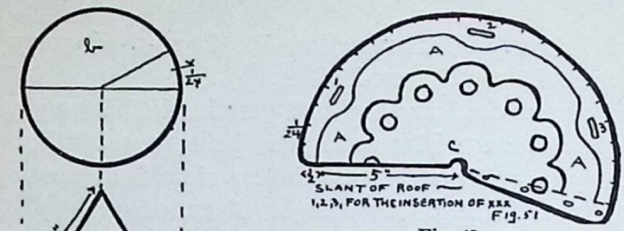


Fig. 43

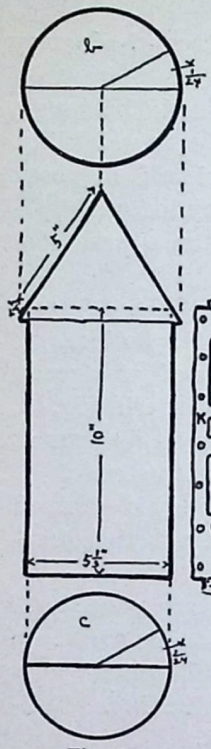


Fig. 41

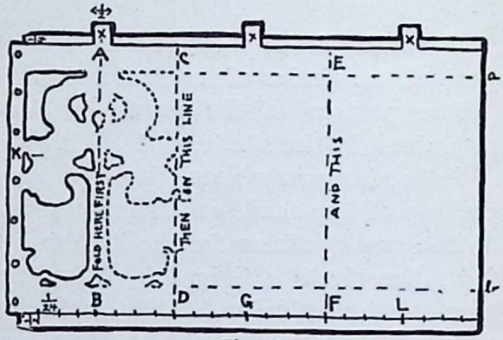


Fig. 42

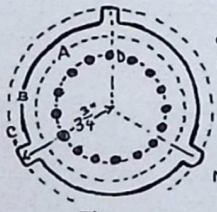


Fig. 44

THIS SHEET SHOWS THE METHOD OF DEVELOPING A PATTERN IN DETAIL. FIRST DECIDE UPON PROPORTIONS AS GIVEN IN FIG 41 HEIGHT, WIDTH, SLOPE OF ROOF, OVER HANG ETC. THEN PROCEED AS SHOWN. IN THIS DESIGN NOTE THE DOMINANCE OF CYLINDRICAL CURVES

See Fig. 58 for an example of this kind, where the straight-edged tool is used with the punch. Lantern B is another example of this method of decoration.

The $\frac{1}{4}''$ margin at the top, and the $\frac{1}{2}''$ margin at the bottom, are for bending over and folding inward to stiffen the edges. The $\frac{1}{2}''$ margin on the side is for riveting, and the square tabs are for attaching to the roof.

Now draw the margin lines *a* and *b*, and it is between these that the design must come.

Several important considerations should influence us in selecting a design for a lantern. There must be sufficient surface perforated to let out a fair amount of light — more than half of the inclosed space. These perforations must be distributed well for two reasons: first, a constructive one, that too large a mass of holes in one space stretches and bulges the metal; second, from an ornamental view-point, the effect would be bad if all the perforations were massed together.

The design must be tied together, as it were, somewhat as in a stencil-pattern.

The tree design which I have used answers these requirements. Sketch in the tree upon half of A–B,

Fig. 42. Notice how it touches the side lines and the top, thus separating the larger and smaller spaces, which will be perforated, and tying together the whole design.

Having sketched half of a unit, the method of folding on A–B and transferring by rubbing is the same as previously explained.

Corrections will be needed here and there to bring the whole together and fit it up accurately. The background spaces are perforated as solid masses of holes.

Instead of gluing the paper upon the metal, the whole pattern may be drawn in pencil directly upon the brass, and the design unit drawn upon a separate piece and transferred into each space.

The upper and lower borders, with the exception of the tabs × × ×, are beaten over before punching. These borders, of course, are bent upon the inside of the lantern. The bending may be started over a bevel-edged rule and beaten down with the mallet.

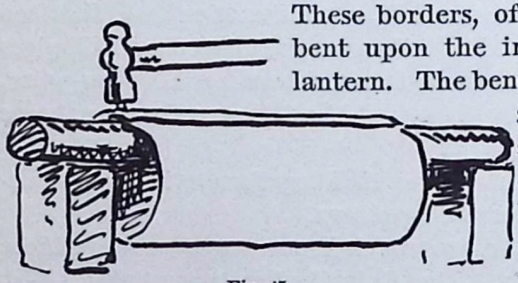


Fig. 45

Punch the flap K for seven rivets and proceed as in the shade.

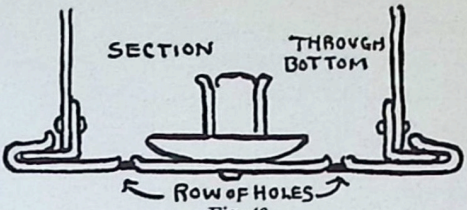


Fig. 46

There may be some difficulty in getting at the rivets in the middle, but it can be done quite readily in the following manner: Secure a bar of metal, a piece of water-pipe, or a bar of hard wood upon which the riveting block of metal may be set, and rest this bar across two tables, blocks, or boxes. String the cylinder upon this, inserting the rivet from the inside and riveting upon the outside, as in Fig. 45. The lantern is bent rough side outward, this being the easier way, and also, in my opinion, the more ornamental.

You may develop the pattern for the top in the same manner as already explained in the shade, and for this the dimensions are given in Fig. 41. The complete pattern is shown in Fig. 43. One circle is described upon a 5″ radius and another upon a 3″ radius. Upon these circles the design is constructed and the interspace perforated (see A in the plate).

Six holes are punched upon the 3″ circle and filed

out to at least $\frac{1}{4}''$ diameter. These are for ventilation. The space marked A–A is the part perforated as a solid mass. The center of the pattern, C, is filed out with a rat-tail to allow for the insertion of a wire after the roof has been bent up.

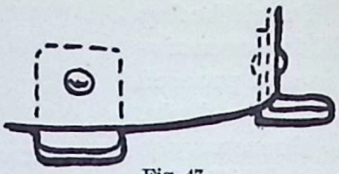


Fig. 47

Four rivets will be needed on the flap, the first one coming as near the center as it can be punched.

The slits 1, 2, 3 are punched with a straight-edged tool at the thirds of the circumference. They are intended to fit the three tabs × × ×, and should be $\frac{3}{4}''$ wide or $\frac{1}{4}''$ wider than the tabs. These slits will come exactly upon the 5″ circle.

Bend up the roof and rivet it over the bar.

Coming now to the pattern for the bottom, we shall find it necessary to construct this from heavy metal, gage 21.

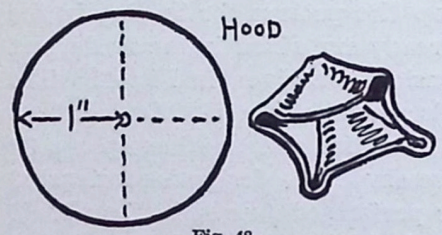


Fig. 48

It is cut carefully according to the heavy lines in 44, allowing the

square tabs to stick out ½″ from the circle B, which represents the projection of the bottom. A is the size of the lantern body, and D, the inner circle, is drawn as a guide-line upon which to punch sixteen equidistant holes (see Fig. 46), rough edges upward.

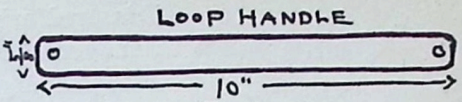


Fig. 49

The drip-cup with a diameter of two inches is next cut out and hollowed, and the candle-holder formed, as in the sconce. These are then riveted to the center of the lantern bottom.

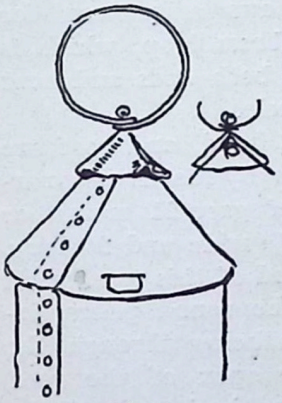


Fig. 50

The three angle pieces, 1″ × ½″, are cut from heavy metal and bent in the middle to a right angle with the pliers.

They are then punched and riveted at the base of the line that passes through each tree—that is, B, G, and L, in Fig. 42.

The manner of attaching these is shown in Fig. 47. Fold a scrap of heavy metal double and beat it flat together; bend the tab of the bottom piece over

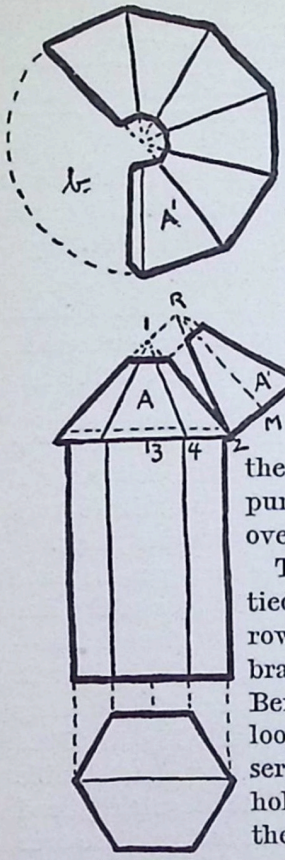


Fig. 51

this, and when the scrap is removed this bend should fit over the angle piece easily, as in Fig. 46. The bend should be adjusted so that the angle will just slip in.

For the hood cut a circular piece of thin brass 2″ in diameter, and perforate it in the center. This may readily be bent with the fingers to resemble Fig. 48. Fig. 49 shows a pattern for the heavy brass loop, which is punched in both ends and bent over to a circle.

The loop, hood, and roof are tied together by means of a narrow strip of gage-21 metal, or brass wire, $\frac{1}{8}$″ wide and 2″ long. Bend one end of this to a small loop over the round pliers, insert it from below through the hole in the apex of the roof, the hood, and both ends of the

loop-handle, and twist it down tightly on top (Fig. 50).

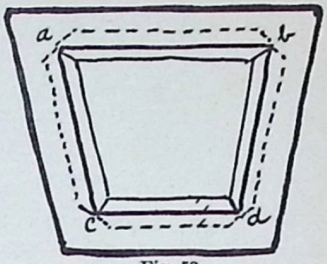


Fig. 52

To put the body and the roof together, insert the square tabs × × × through the slits 1, 2, 3, and bend them down outside. The slits are purposely made wider than the tabs, to allow for any variation in the pattern; but if the measurements here given are carefully followed there should be no trouble about fitting.

In the plate A is the lantern which we have been constructing. B is triangular, but the design, which is composed of squares and triangles, may be equally well applied to a square lantern.

In making this triangular lantern a wooden block planed to an equilateral triangle will be necessary for forming the corners. The roof may be made in one or three pieces and riveted. (See lamp-shades.) C, D, and E, may also be made in one or several

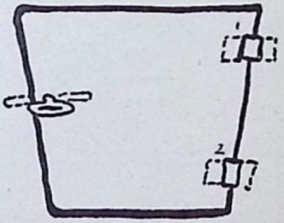


Fig. 53

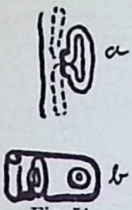


Fig. 54

pieces. A little explanation is needed about developing these roofs in one piece. First draw the front elevation of the lantern to exact size (Fig. 51). In this case it is the hexagonal lantern C.

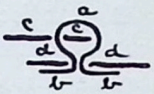


Fig. 55

Now, A is one surface of the roof seen in perspective. The distance 1–2 is projected to R–M, and is the same as 1–3, which is seen in perspective.

The edge 2–R equals the edge 3, so drawing R—R and R–2 we have the actual length of the perspective length 1–4, giving A′ the actual size of the perspective A. Now describe a circle with radius R–R, and on its circumference space off six of 2–M–R, and add a lap for riveting, giving the pattern 51 *b*. Attach the roof as previously explained.

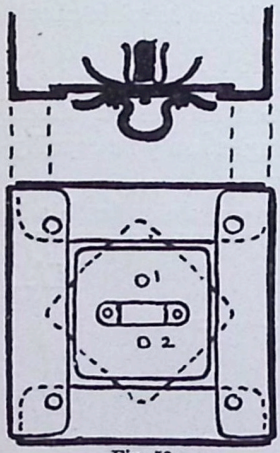
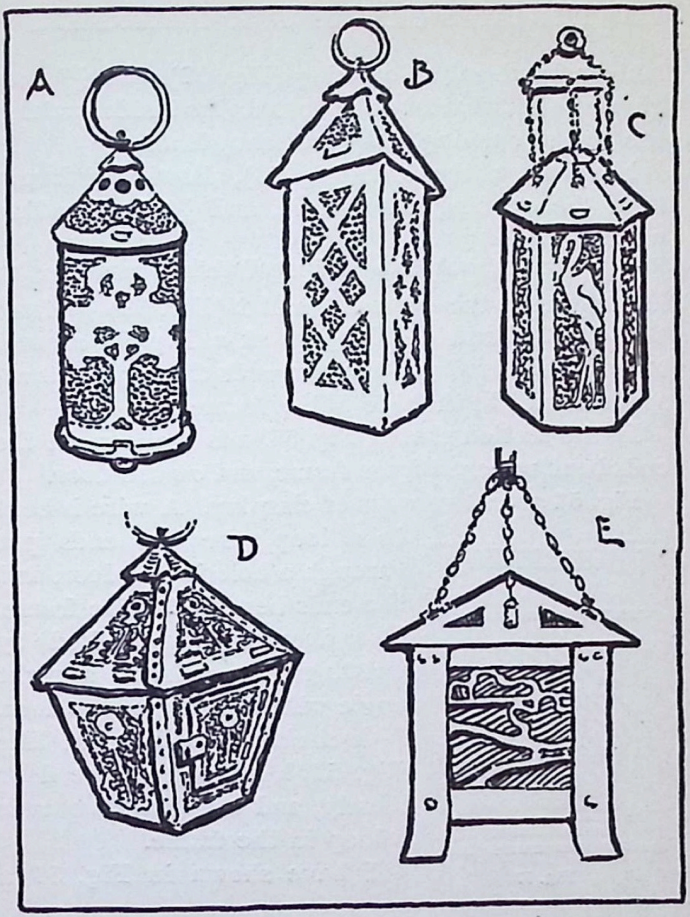


Fig. 56

Lantern D shows a door in the side for inserting the lamp or candle. In one side of the


A
B
C
D
E

lantern frame cut an opening (Fig. 52) with $\frac{1}{4}''$ margin to be bent back to the dotted line inside, making the size of opening, *a*, *b*, *c*, *d*, heavy lines.

Now cut out the door (Fig. 53), allowing $\frac{1}{2}''$ larger than the opening all around, and $\frac{1}{4}''$ for bending under.

For hinges, cut two strips of thin brass $1'' \times \frac{3}{8}''$. Make cuts in the door at 1 and 2 (Fig. 53) $\frac{1}{4}''$ from the edge. Bend the loop as at *a*, Fig. 55, around through this, and put the two ends through a corresponding slit in the side of the frame.

In the section sketch, Fig. 55, *a* is the loop, *b b* the ends bent under, *d d* the frame, and *c c* the door.

Fig. 54 gives two ways of clasping. A wire is bent to a loop, the two ends put through a hole in the door, and the ends bent under the frame. The door is then locked by twisting the ends to a right angle with the edge of the door.

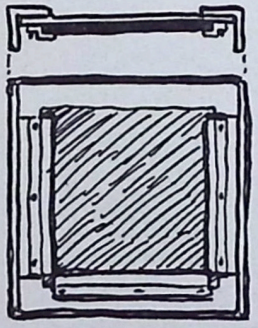


Fig. 57

Or a clasp may be filed like Fig. 54, *b*, riveted to the door loosely, and caught down over a loop in the frame.

I have shown in Fig. 56 a

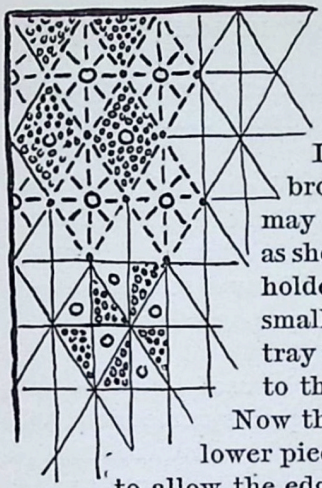


Fig. 58

simple way of setting the light in through the bottom, applicable for any lantern other than a cylindrical one. In cutting the sides allow broad laps at the bottom, which may be bent under and riveted as shown here. Rivet the candle-holder upon the center, or, if a small lamp is used, form a square tray to hold it, and rivet this tray to the upper square. Now the handle is riveted and the lower piece bent away from the upper, to allow the edges of the lantern bottom to slip between. Place the light in its holder, set the upper square through the opening, and give the handle a turn so that the corners catch, as in Fig. 56.

Lantern E is designed for stained-glass panels, to be inserted in a riveted frame-work. (See Fig. 57.)

A sheet of brass or copper may be etched out, leaving a frame, behind which we may place the glass (lantern E). Other combinations and methods will suggest themselves to the ingenious worker.

PROBLEM V—LETTER-BOX

The hanging letter-box is another very useful and attractive object to be made from either brass or copper.

From a sheet of gage-21 metal cut a piece $6\frac{1}{2}'' \times 11''$, and within this draw a $\frac{1}{2}''$ border, punch holes, and screw upon the block as in the tray and sconce.

Now upon a piece of paper draw a rectangle $5\frac{1}{2}'' \times 10''$, and cut out of the paper, leaving a flap at the top, as in the tray.

The design in Fig. 59 may be used, or any other good design, preferably a two-part symmetrical pattern. This problem is to be finished in repoussé or beating up from the back.

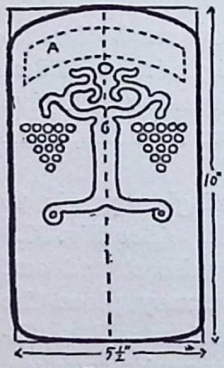


Fig. 59

Fig. 59 is a conventional treatment of the grape-vine, adapted to this method of working with a rounded tool. The space above, A, is left for lettering; the space below will, of course, be covered by the box.

From a 4″ length of $\frac{1}{4}''$ bar of tool-steel file a tool like Fig.

60 *d*, smoothly rounded upon the end. The metal should first be filed square, as in 60 *a*, then a bevel taken from the edges as in *b* and *c*, finally smoothed to *d*, and finished with emery-paper.

Let me repeat here about tempering a steel tool. After the surface is polished smooth, heat the whole end in a coal fire or over a flame until it glows rosy red. Then plunge quickly into cold water, dry, and polish again with emery.

This tool is held in the same manner as the nail stamp, but the resulting impression should be smooth and unbroken. The design depends upon its embossing or relief, rather than in the difference of texture. Practise to move the tool along in a continuous, even movement to cover the whole surface of the design.

Beat in the grapes first, twirling the tool about to insure getting a circular impression, next the stems and branches in as smoothly continuous an impression as you can accomplish.

With a metal as heavy as gage 21 the forms of the design should be quite clearly defined, avoiding very small spaces; and the intervals between the parts (i. e., the background) must be more open than if a thinner metal be used. The beaten side

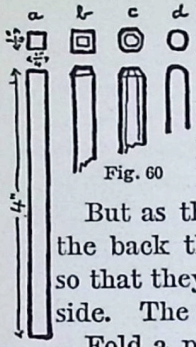


Fig. 60

will be the back of the holder, the raised surface forming the face.

Any letters or monogram must first be carefully drawn upon a piece of paper cut to fit the space allowed—A, Fig. 59.

But as the letters must be stamped in upon the back they must first be drawn in reverse, so that they can be read from the front or raised side. The simplest way of reversing is this:

Fold a paper upon the line A–B, Fig. 61, and within the upper half sketch the letters to be placed within the space A, Fig. 59, in their proper size and order. Outline them clearly with a black pencil fold upon A–B, and transfer by rubbing.

This will give you the exact reverse of the letters as in the lower space (Fig. 61). Transfer the reversed word into the given space and finish the stamping.

The dimensions for the box part are given in Fig. 62, with the extra margin allowed for screwing upon the block.

Be careful to square all corners and to measure very accurately. The design is drawn upon a paper $3'' \times 4''$, allowing a margin above for tacking upon

the block. The grapes and curved stems are beaten in, and also the leaf around the veins.

Fig. 61

The diagram at the lower part of Fig. 62 shows how this piece should be bent and riveted upon the back.

The bending is best done over the square angle of a hard-wood block, using the mallet, and the raised surface of the design, as in the other piece, should face outward. In the narrow margin, $\frac{3}{8}$", punch three holes for rivets and insert the rivets from the front, setting them down upon the back of the holder.

One danger is that of getting the box unevenly placed upon the back piece, and very careful measuring will be necessary to avoid this error.

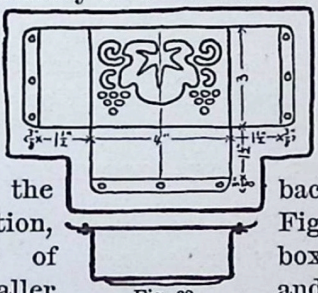
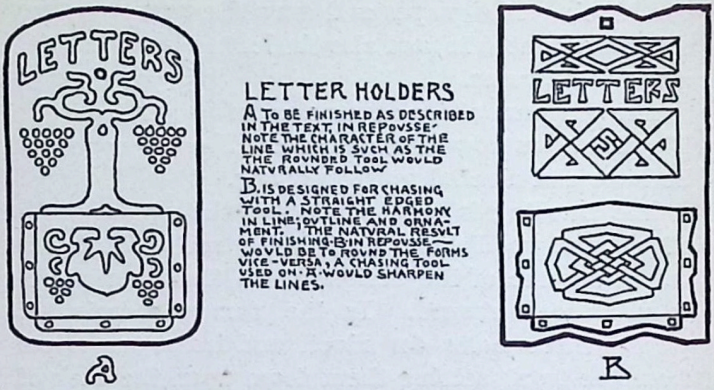


Fig. 62

In the plan given the box piece should be riveted about $1\frac{3}{4}$" from the lower edge.

Finish by curving the edge from the back, as shown in the cross-section, Fig. 62.

This style of box may be made a little smaller and used for a



match-box, or the design may be stamped as in the sconce.

This completed design and one other for the same purpose are here illustrated.

The design B might be executed in metal and wood, carving the outline decoration with the knife.

PROBLEM VI — COPPER BOWL

Copper, being the more ductile metal, is better adapted than brass for beating up as deep an object as a bowl.

As the copper stiffens under the tool, it will be necessary to heat or anneal it to get it again into a pliable condition. This may be done by placing the metal in a stove or furnace, or by forcing a gas flame upon it in the method used by professional metal-workers. Heat it to a rosy red and then cool slowly.

For this problem describe a 7″ circle upon the copper and cut it out with the shears, then describe the other circles as in Fig. 63. The outer circle is only the rim which is allowed for screwing to the block, and is cut off later. Circle A is the real edge of the bowl; within this comes a $\frac{1}{4}$″ border and then a $\frac{3}{4}$″ band, bounded by circle B.

Within this band we place as ornament a repeating border. The circle at the center with a 1″ radius is to define the bottom of the bowl, and the other circle is simply a guide-line to aid in beating up.

With the 30°–60° triangle divide the circle into twelve parts, punch the holes within the outer border, and screw the metal to the soft-wood block as in previous problems.

Upon a bit of paper describe circles and lay off, Fig. 64, equal to one section of Fig. 63.

In the space allotted for the border draw some unit

which will repeat well twelve times—something like the pattern given.

Cut out the wedge of paper, and, fitting it into the corresponding space upon the metal, transfer with carbon-paper, holding the pattern by its apex.

The background of the border should be stamped

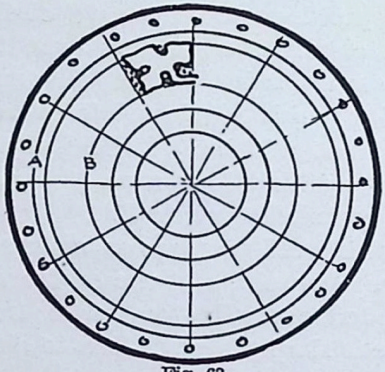


Fig. 63

rather deeply with a medium-sized stamp. There is the danger of perforating to be guarded against in this.

The small rosette pattern for the center is punched upon the reverse side, and it may be left out entirely without seriously modifying the effect.

Trim the metal to circle A, Fig. 63.

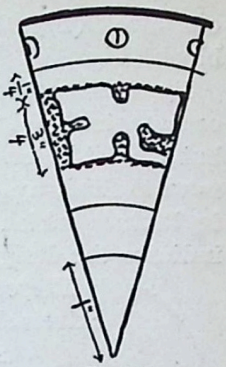


Fig. 64

You will need to purchase, make, or have made, a stout canvas or leather bag, something like a pincushion, 6″ in diameter. It may be either circular or square.

Or any large hardware dealer will order for you an engraver's pad, costing about $1.50.

Rest the disk of metal upon the pad with the outer stamped side downward, and with the round end of the mallet beat it in a series of circles from the inner circle outward, at the same time gradually tipping the piece (Fig. 65).

As you go on with this "forming," the metal will wrinkle at the edge and stiffen quite rapidly. Anneal or heat it, and beat out the wrinkles upon a hard-wood block.

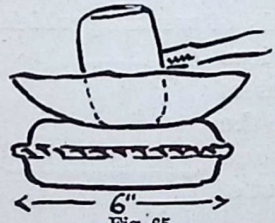


Fig. 65

In order to get the bowl the required depth, a block in shape like Fig. 68 must be rasped and sandpapered from hard-wood, and another to the shape shown in Fig. 67.

Beat the bowl down into the

one block (Fig. 67), and over the block (Fig. 68).

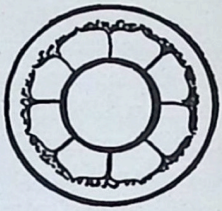


Fig. 66

By this method of work the ornamental band will be flattened, but cannot be entirely beaten out, so we shall always have a difference in texture which will sufficiently indicate the design.

These designs (Figs. 69 and 70) are both extremely simple, with a minimum of stamping.

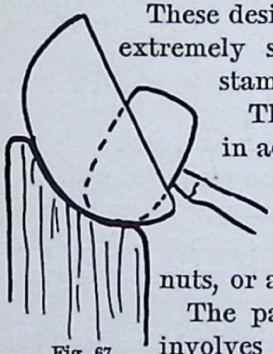


Fig. 67

They may be executed by etching in acid, as already explained in the problem of the lamp-shade, and when completed the bowl may be used for spring bulbs, for nuts, or as a finger-bowl.

The page illustration of candlesticks involves no methods of working which have not been explained in previous problems. Surely the examples of metal-work given will suggest to the student other objects properly and consistently to be constructed out of this material.

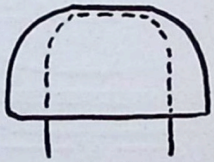


Fig. 68

Its durability and the richness of color and design obtained by very simple means have deservedly made this branch of the crafts very popular.

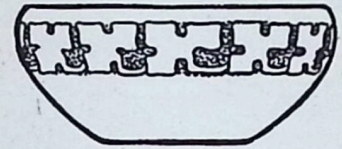
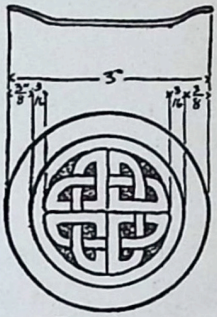


Fig. 69

ETCHED OR STAMPED COPPER OR BRASS

Fig. 70



PIN TRAY

Fig. 71

CHAPTER V

LEATHER-WORK

PROBLEM I — How to make a Note-book
PROBLEM II — How to make a Card-case
PROBLEM III — How to make a Magazine Cover
PROBLEM IV — Carved Leather Napkin-ring

CHAPTER V

LEATHER-WORK

THE great popularity of leather-work among amateurs is due in great measure to the ease with which the art may be acquired, and to the fact that a small and inexpensive equipment is all that is required; and also because of the richness of the material and its durability.

The art of modeling or embossing leather is little more than drawing upon the dampened material, and, therefore, a knowledge of design is of great importance.

Of great importance, but not of absolute necessity; for one may do as many students without opportunity for the study of design have done—one may trace, copy, or adapt the designs of others. Here

the critical faculty is necessary in order to know what to select for a given object, and in this connection it would be well to read carefully the chapter on design.

There are various methods of manipulating leather, such as incising, carving, appliqué, staining, tooling, burning, and embossing. The last-named, as it is the simplest method, will first be explained here.

The selection of material for work in any craft is of prime importance, and in leather-work it is rather more difficult to distinguish between good and inferior hides than it is to select a fine piece of oak or a sheet of metal of the proper quality. One has to take risks and learn by experience.

A test which will help somewhat is to indent the hide with the thumb-nail, and if it retains the impression thus made it will probably model well.

The highest grades of Russia calfskin, ooze calfskin, or split cowhide, ooze finish, should be secured for modeling. Sheepskin will not model well, but will do finely for perforating, burning, or inlaying.

There are comparatively few difficulties to overcome, and we will meet them as they present themselves. Following is the necessary equipment:

Two modelers (Fig. 1), each having a tool on both

ends, one of the four ends sharp and three-cornered in section for incising lines and pointing, and the other ends blunt, thumb-shaped modelers of various sizes; and these are used for pressing down the surface of the leather.

A slab of marble, slate, or glass not less than 9″ ×

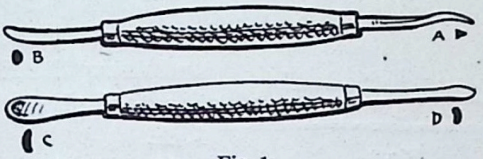


Fig. 1

12″, a triangle, a 1-foot rule, a sponge, and a sharp-cutting knife completes the list.

PROBLEM I—HOW TO MAKE A NOTE-BOOK

Thus equipped, we may begin with something which shall not be too difficult—say a pocket note- or address-book.

Procure a small blank-book and remove the card-covers, or make a book by sewing together leaves of some good paper. (See chapter on simple book-binding.)

The book being 5″ × 2½″ in size, we will cut the

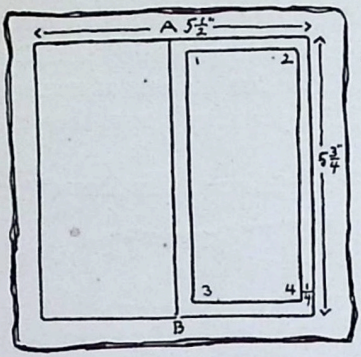


Fig. 2

cover so that it shall project ¼″ at either side and end, with ¼″ allowed for the back, thus giving us 5¾″ × 5½″ (Fig. 2).

Measure this size carefully, using the triangle to insure square corners, and draw the lines with the tool shown in Fig. 1, A.

No cutting will be done until the whole work is finished. During the process of modeling, the leather must be kept in a dampened condition. Wet the under or flesh side with a sponge, being careful not to saturate it so that the water soaks through to the finished side.

In drawing or tracing straight lines always use the rule or triangle and move the tool from left to right (Fig. 3), and slanted back at an angle of about 45°.

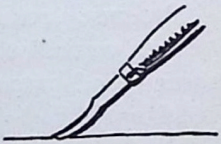


Fig. 3

Draw the line A–B, Fig. 2, with the sharp point (Fig. 1, A) midway between the sides of the larger rectangle. Measure ¼″

from outside upper and lower edges and $\frac{5}{16}$" from the center line, and draw the oblong 1, 2, 3, 4 in the right half of the piece of leather.

In this oblong the front cover design is to be placed.

In tooling the corners there is a tendency to carry the lines over into the margin. To avoid this do not draw the lines quite to the corner at first and finish them afterward as follows:

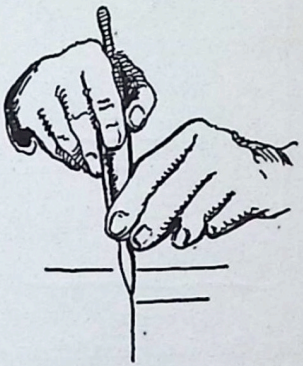


Fig. 4

Hold the sharp-pointed tool in a more horizontal position, pressing the point down with the first two fingers of the left hand, and push the tool forward.

The under-side of the tool will take a straight course, following the line to where the corner is to be. At this point turn it up, sharply, assuring a well-defined corner (Fig. 4).

It is of course difficult, even with the help of drawings, to explain these details exactly in words, and a little practice upon scraps of leather will be of great value.

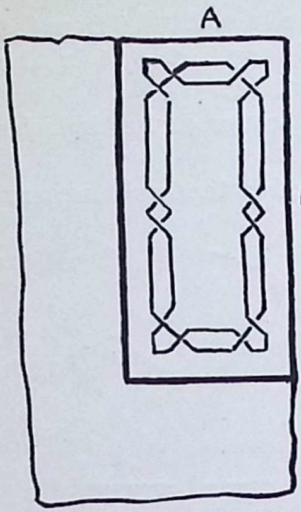


Fig. 5

With the first handling of the tools let your design be simple. In such work accuracy is important in laying out a skeleton plan or design, and the 1-foot rule should be used frequently. Do not fear that by so doing you will obtain a mechanical effect, for the free-hand finish over the outlines is bound to "loosen up" your work sufficiently.

A simple interlacing pattern is always effective. What can be more interesting, for instance, than the Moorish patterns or the Celtic knottings, which may be simplified for our purpose?

With the piece of work in hand the oblong to be filled is $5\frac{1}{4}'' \times 2\frac{1}{4}''$. Measure such a space upon paper and adapt your design to it. It is well to cut the paper upon two sides of the oblong, as A–B, Fig. 5, so that it may be placed more accurately in the given space.

Trace carefully through the paper with the pointed tool or tracer, holding it at an angle slightly below a right angle.

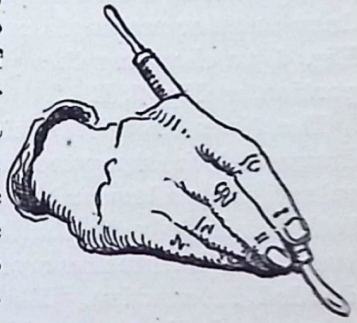
Then remove your paper and strengthen the lines where it is needful.

The hardest work will then be accomplished, and you may proceed with the actual modeling or "laying down" of the background, thus lifting or raising the design in relief.

The laying down is done by pressing heavily and evenly with the broad-pointed tool all around the lines and working toward the part to be raised.

If the leather wrinkles you may know you are pressing against the fibers, and it will be necessary to change the direction of the tool so that the leather takes the pressing in a smooth and glossy manner.

Should the water come to the surface during the process, do not attempt to proceed with the modeling until it has somewhat dried out. Under proper



METHOD OF HOLDING THE TOOL WHEN PRESSING DOWN BACKGROUND

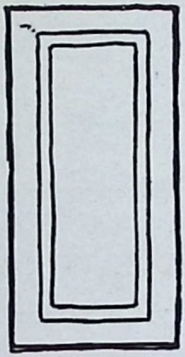


Fig. 6

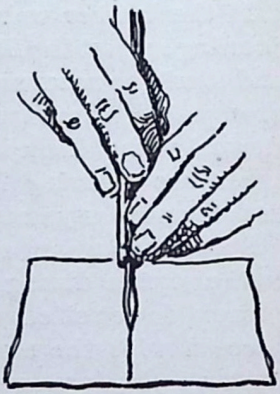
condition of dampness, the parts of the leather pressed down will be darker than the original skin color.

Use the soft point (B, Fig. 1) for small places and corners, the larger tools, C and D, being reserved for the manipulation of larger spaces.

The back of the cover may be left plain, or may be finished in the following manner:

Mark out an oblong of the same size and distance from edges as the one on the front cover; measure $\frac{1}{8}''$ inside each line, and draw another rectangle, as in Fig. 6, or changing the proportion, as Fig. 7, B.

The lines should be first drawn with the sharp tool and ruler lightly, afterward using both hands to push the tool over them. This makes a very decided indentation. Model down evenly the space within the oblong.



METHOD OF HOLDING THE TOOL IN LINING

The cover being now ready to adjust, cut through the outside lines A, A, Fig. 7, with a sharp knife.

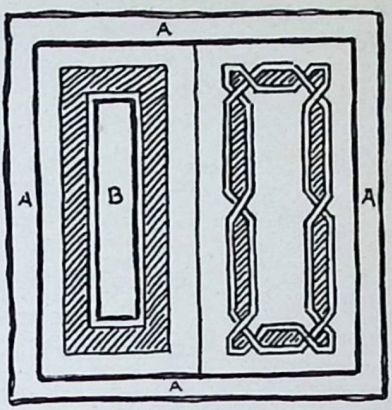


Fig. 7

As the book is small, the leather will make a cover sufficiently thick without any lining.

Sew the leaves of the book to a strip of thin strong cloth as near the color of the leather as may be, or, if necessary, use white cloth and stain it with water-color paint.

The band must be at least $\frac{1}{4}''$ wide (Fig. 8, A).

Before the cover is perfectly dry and before the edge is cut off, fold it over on the center line and press firmly under heavy books.

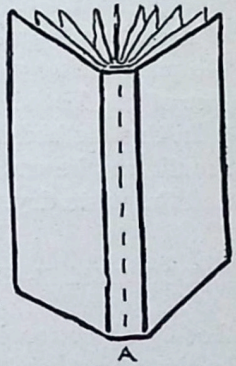


Fig. 8

Let it dry thoroughly in this

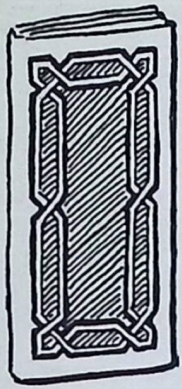


Fig. 9

position, then rub well into the fold, with your fingers, some SPHINX leather-paste, and paste the band A evenly into the fold and press the back tightly. Afterward open the cover and remove any paste which may have spread outside the cloth back. Fig. 9 shows the book complete.

In larger note-books it is advisable to line the covers, and when this is done the leaves are sewed to a piece of skiver or very thin pared sheepskin, as large as the covers.

Then this is pasted to the entire decorated cover, the paste being well rubbed in over the whole surface of the leather.

In this method of finishing the superfluous leather should not be cut away until the lining is in place and the paste dry.

PROBLEM II—HOW TO MAKE A CARD-CASE

Good proportion is one of the first considerations in all fine art, and a great deal of time may profit-

ably be spent in the nice adjustment of parts, ornament, background, and border.

In this little card-case, for instance, simple as it is and rather limited as to size, there is bound to be some relation of width to length, of cover and of depth of pocket, which is better, and more satisfying to the sense of balance, than any number of other possible proportions.

It is well to fold a piece of paper into the shape of a case like Fig. 10; and Fig. 11 will give an idea of the inside of the finished article, as well as the decoration upon its cover.

Fig. 10

In the making, this problem will require a piece of leather as long as four times A and as wide as B, with at least ½″ all around for working.

The "laying out" or planning of the pattern, as before stated, is a delicate piece of work, and should be done with the utmost care. For this work the triangle is a most necessary tool.

When the leather has been cut, with due allowance for margin, and dampened upon the back, rule the four spaces required—two for the covers and two for the flaps or pockets. Let us say that this case is

$2\frac{1}{2}'' \times 3\frac{1}{4}''$ when folded, or that A, Fig. 11, is $2\frac{1}{2}''$ and B$=3\frac{1}{4}''$.

Take the piece in hand and fold it over evenly, creasing it in the middle; then rule a line on this middle fold. We shall call this the working line, as all measuring will be done from it. Draw the line B–C, Fig. 12, and $3\frac{1}{4}''$ below it D–E, squaring from A with the triangle. From A measure $2\frac{1}{2}''$ to the right and to the left, and from these points draw verticals to D–E.

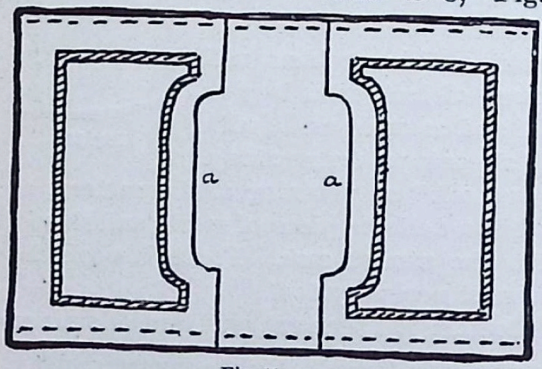


Fig. 11

The outer divisions are to be the inside flaps or pockets of the case, and they should be about four fifths the width of the covers.

Fig. 13 shows the complete shape, and × × × × are the borders which shall be trimmed away finally.

Either space 2 or 3 may hold the front cover. If 2 be the smoother, turn the leather so that it will come on the right-hand side. In the pockets one or two lines, as in Fig. 11, tend to refine and finish the shape.

Upon the front cover, the right-hand side, let us put a simple landscape. The lines, of course, cannot all be ruled, and therefore none of them, not excepting the horizon, should be, or the result will be discordant. There is a noticeable difference between the rigid machine-line and the slight tremor or vibra-

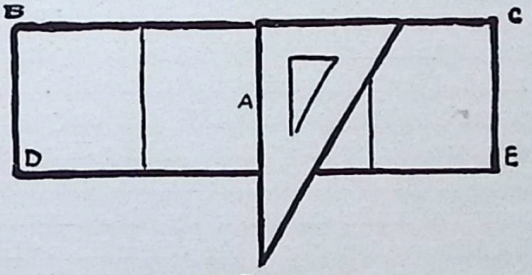


Fig. 12

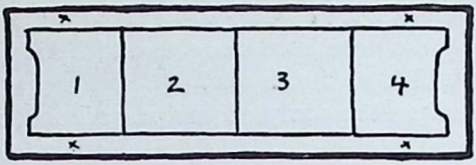


Fig. 13

tion caused by even the steadiest human hand. It is this thing which gives richness and artistic value to hand-work. The lines upon the back and flaps of the case, though first ruled to secure correct placing, should be afterward gone over without the straight edge to bring them into this harmony. The lines of the cover design may be drawn through tracing-paper. After this has been done, some spaces are modeled up into relief by pressing down other spaces. Every design, then, should be studied to see which parts had better be depressed. The lines alone might be incised or a slight space upon either side modeled, but the effect is better if the whole background surface is "layed." Not only a relief, but a dark and light effect is gained by this method.

In the design under consideration, the sky and road may be made effective by this means, and enough of the surface about the other lines "layed" to mark them distinctly.

Use the soft point of the tool, pushing it toward the parts to be raised. Next press down firmly upon the outside of the outline, and then press the leather away from the raised part, in this manner graduating the relief. The tree trunk is left raised, as well as the foliage. The distant hills should be raised above the sky, but less so than the tree; and the land in front should be in higher relief than the hills.

Sky and road may be pressed down smooth and glossy, leaving one or two little irregularities or ridges in the road to indicate the ruts.

But avoid too much detail. Do not attempt to imitate the photograph or a drawing in pencil; but treat the material in a frankly flat and decorative manner, striving only for enough detail to break monotonous spaces.

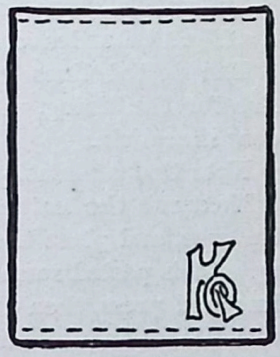


Fig. 14

Modeling is really good drawing, and with continued practice with the tool the student will discover many little touches of his own.

Upon the back of the case

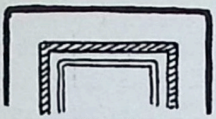


Fig. 15

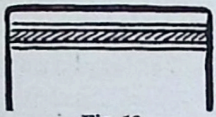


Fig. 16

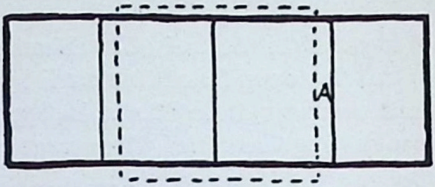


Fig. 17

a monogram may be either raised or depressed, either in an inclosing space or without. (See Fig. 14.)

The effect of lines may be studied in Figs. 15, 16.

When the work has been carried to this point, the leather is ready for lining.

Cut with a sharp knife the outlines of the flaps, *a*,*a*, Fig. 11, but leave the other edges uncut.

The dotted lines in Fig. 17 indicate the proper size for the lining, which should be a piece of soft ooze sheepskin.

Note that at least $\frac{1}{4}''$ is left at A.

Next rub the leather-paste well into the inside of the case, and place the smooth side of the sheepskin upon this pasted surface. Fold over on the center line and press, then unfold and rub evenly over the two pieces in the manner in which one mounts a photograph. The leather being still damp, it will

retain the final folded shape if placed under a weight of books.

As soon as it has well dried under the weight, the stitching may be done upon a common sewing-machine or upon a shoemaker's machine, using a medium-sized needle and twist or sewing-silk.

Fasten the ends of the thread under the flap, and then with a sharp knife cut the superfluous leather away with one clean knife-cut at least $\frac{1}{8}''$ outside the stitching. (See arrow, Fig. 18.)

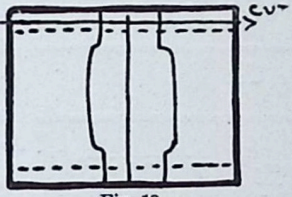
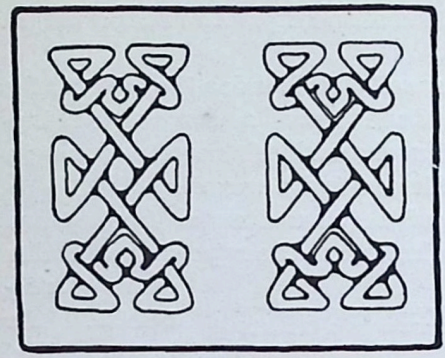
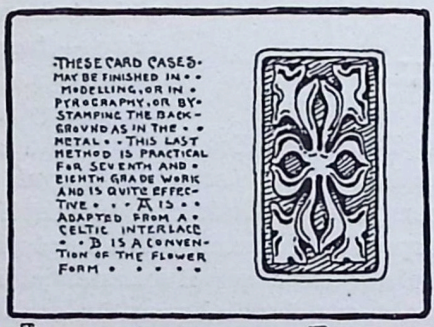


Fig. 18

The design which we have been considering — tree, road, and hills — belongs to that class which may be called naturalistic. It is taken directly from nature, retaining the natural relation of parts, with irregular shapes and some perspective; but it has been simplified to cover a flat space ornamentally. I have given it here as an example of one school of ornament, and a large and important one, founded upon the art of Japan. If we can acquire the delicacy of tint, the expression of line, and the wonderful individual character of plant and animal form in which the



A



FB B

Japanese excel, we shall, indeed, be far advanced on the road of artistic expression.

Yet I cannot but feel that as ornament, to be applied to a given object, to be used for a definite purpose, Japanese ornament is in many cases too abstract, and approaches more the pictorial than pure subordinate decoration.

Study Japanese art, for the qualities above named; but keep it in its place, and look rather to the Greek, the Gothic, the Scandinavian, and the Celtic for true principles of decorative harmony.

PROBLEM III — HOW TO MAKE A MAGAZINE COVER

The perforated and inlaid magazine cover which we are to develop in this present problem will carry us into more advanced work and lead naturally to the carving, which is to follow.

You will need a large piece of Russia calfskin or sheepskin, a piece of soft sheepskin, of the same size for lining, or one quarter yard of silk, or velvet if preferred, and the tools used in previous work. In addition, you must have two knives like those in Fig. 20.

Suppose the cover is for "The Century Magazine," we shall cut a piece $15\frac{3}{4}'' \times 10\frac{3}{4}''$. This allows $\frac{3}{4}''$ for the back and an overlapping margin of $\frac{1}{2}''$. Make the design upon paper of the same size as the cover.

Start with the piece of leather perfectly square as to corners and of equal sides; then find the center line, and measuring $\frac{3}{8}''$ from it each way rule the lines which include the back piece (*a*, Fig. 21). We have now the two separate sides 1 and 2 to consider. Measure 1″ in from the edge of each side all around, and rule carefully the oblongs which are to contain the designs. Lines will be a sufficient decoration upon the under cover.

Fig. 19

Select the smoothest side for the upper or front cover, which will be upon the right-hand side — 2 in Fig. 21.

The design (Fig. 22) should be accurately drawn upon paper of the same size as one cover, allowing a margin on two sides for holding or for tacking down to a board. Then trace carefully into the oblong space (Fig. 21).

The parts to be cut out should be well defined, avoiding small irregular shapes.

Treat the leather in the same manner as for modeling; in fact, the leather should be modeled before it is perforated.

In this design (Fig. 22) there are eight curved spaces to be cut, and these seem to grow out of the lines of the design. These spaces should be first worked over carefully with the

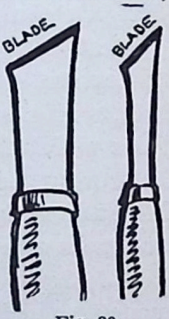


Fig. 20

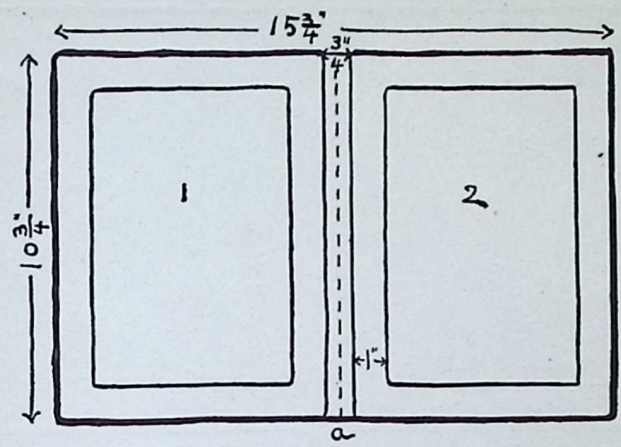


Fig. 21

blunt tool, pressing them hard and sharply to the line. The long lines and letters may be either depressed with the V-shaped tool or raised by modeling the leather around them. The little diagram at Fig. 24 shows how the lines may be raised into ridges.

The tooling, or lining, with the back of the sharp-pointed tool, is simpler and as effective.

Finish all of the modeling and let the leather become perfectly dry before any cutting is done.

When it is finally ready, place the leather upon a

Fig. 22

Fig. 23

smooth board of soft wood, and with the sharp knife (Fig. 20) cut out the spaces. If these spaces are regular curves—that is, arcs of a circle—or straight lines, chisels and gouges may be used to advantage. But in the design in hand we must use one of the knives in Fig. 20, the smaller one for smaller spaces and sharp curves. Cut straight down, holding the tool in a vertical position (Fig. 25).

Should your design include many openings placed closely together you would need one quarter yard of

silk or panne velvet to place underneath. In this case we shall use two strips of panne velvet or a soft, harmonious shade of ooze sheepskin or silk. A variegated design is often pleasing when the shapes admit of such a combination.

Fig. 24

Lay the cover face downward upon a clean cloth and rub the paste well into the leather all around the open spaces; place the velvet face downward over these spaces and smooth it across several times with a cloth or the hand. This will press the nap of the velvet to the edges of the openwork.

Any paste which oozes out may be removed with the sharp modeling-tool, but be extremely careful not to get the paste upon the front of the leather, or a dark spot will be left.

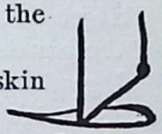


Fig. 25

If we line the cover with soft sheepskin either side may be used. The ooze is perhaps the daintiest.

In lining, rub the paste well into the wrong side of the cover, omitting the spaces 1 and 2, Fig. 26, which are already lined with velvet.

Place the piece of lining (a little longer than the modeled piece) upon the pasted part, and

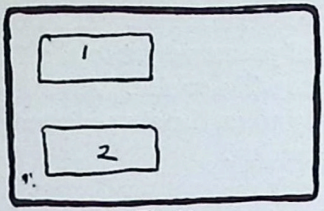


Fig. 26

rub the two gently together.

Fold the sides, then open again as you would a book, to keep the leather stretched at the fold.

Place the cover on a smooth surface and press it under a smooth object until perfectly dry.

The next step is the lacing of the edges.

When the superfluous lining has been cut away tool a line all around the cover $\frac{1}{2}''$ from the edge (Fig. 27).

On this line, and beginning from the corner, place points about $\frac{1}{2}''$ apart, and punch holes at these points, taking care to place the points exactly in the center of the punch.

A good wheel leather punch can be bought for 75 cents which will admit six sizes of holes.

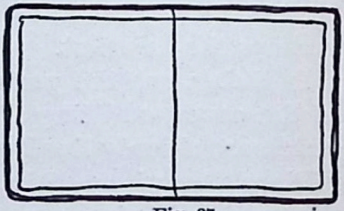


Fig. 27

With a long rule and very sharp knife, cut narrow thongs of the calfskin about $\frac{3}{16}''$ wide.

This is a very difficult

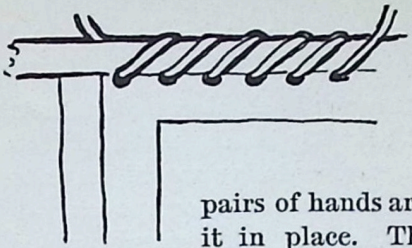


Fig. 29

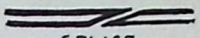


Fig. 28

matter, as the leather slips from beneath the rule, and two pairs of hands are most useful to keep it in place. These thongs may be spliced placed together as in Fig. 28, and pasted with leather-paste until you have a piece twice and one half the distance to be bound.

Beginning at the fold of the cover, bind over and over through the holes (Fig. 29), all the way around, and tie the two ends at the top of the inside, leaving one long thong hanging. Tie another thong at the lower end of the fold and knot the ends of both.

These thongs are to keep the magazine in place, and may be tied at the lower opening of the magazine. Finally, if large, heavy beads are hung on the ends the result is most attractive.

Inlaying.—Suppose we wish to lay in a design of various colored leather.

Trace the design and model to a finish as in previous work.

Place the leather which is to be inlaid beneath

the cover-leather and fasten both firmly to the board.

Cut out the spaces through both pieces of leather.

I would advise that inlaying be done with chisels and gouges, and of course the design would have to be adapted to straight lines and regular curves.

Then the spaces of the one color may be fitted into the openings of the other and both held firmly by the lining, to which both are pasted.

A music-folio of larger dimensions may be finished in this way.

In the thistle design (Fig. 23) the black spaces may be perforated or inlaid; or some of the larger spaces about the border may be cut out and all of the center modeled.

PROBLEM IV—CARVED LEATHER NAPKIN-RING

In any of our large museums, and in many private collections, one will find old pieces of furniture decorated with seats and panels of carved and stamped leather.

In the Middle Ages, this was a favorite medium of decoration in connection with woodwork, and the

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artisans of that time produced some rich and durable pieces.

In the limited space of this chapter I can merely touch upon the subject of carved leather-work, but it is of such a nature that a few suggestions to the student, if he have any initiative at all, will open up to him an interesting field of labor.

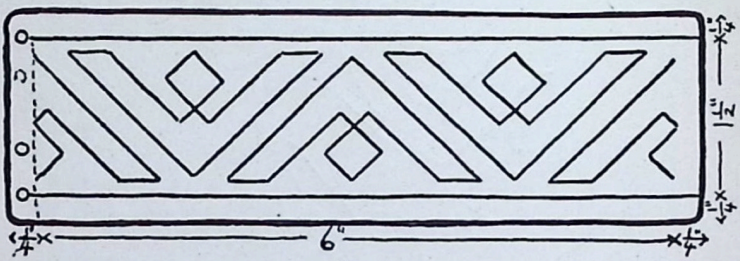


Fig. 30

Some experimenting with the tools as to the best means of working ought to yield a fair measure of success.

Thick cowhide or sheepskin is excellent for this work, and sheepskin may be purchased for $1.50 a hide.

The making of a napkin-ring is a simple problem, yet one that will give an idea of the general methods of working and the essential details.

The material is well suited to such an article; for leather is tough, light, flexible and clean, not easily broken or torn, and with reasonable care need not become soiled.

Cut a piece of leather $6\frac{1}{2}'' \times 2''$ (Fig. 30), and square it carefully with the triangle as described in previous problems.

Upon the finished or smooth surface, $\frac{1}{8}''$ from one end, rule a line with the pointed tool, and another $\frac{1}{4}''$, both parallel to the end.

Fig. 31

Fold both ends together, as in Fig. 31, and upon the $\frac{1}{8}''$ line punch four holes through both thicknesses.

Cut a paper pattern to the size of Fig. 30, draw the horizontal lines, fold the paper in two or four

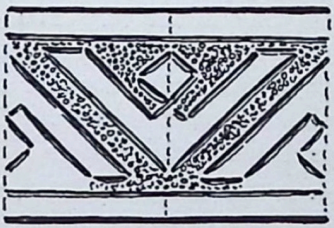


Fig. 32

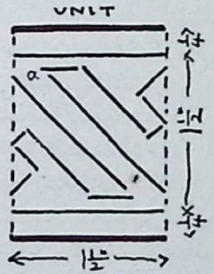


Fig. 33

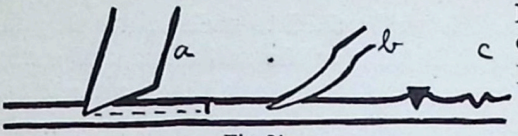


Fig. 34

parts, and draw either Fig. 32 or Fig. 33 as a unit, folding and rubbing, and so completing the whole.

This pattern may be fastened securely upon the leather by putting tacks or pins through the punched holes in either end.

Then transfer the lines to the leather by pressing through with the pointed tool.

The design here given is one that will explain itself from any viewpoint, and some such repeating pattern of at least three units is better for this problem.

The lines are cut straight into the dry leather, one half way through (see Fig. 34, *a*). The difficulty is to do this without going all the way through.

Of course this process weakens the leather, and if it is used in a belt or any object which must sustain a strain, only heavy cowhide will answer.

It is better to leave a slight interval or bridge between the cuts, especially where two lines come together at a long angle, as they do at *a*, Fig. 33.

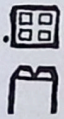


Fig. 35

After all the cuts have been carefully made, wet the leather, and with the V-shaped tool spread them as indicated in Fig. 34, *b–c*. This process will push the leather upon either side to a slight ridge (*c*, Fig. 34). Now, if desired, you may leave the design in this condition, or the background spaces may be first modeled and then stamped. (See Fig. 32.)

The little diagram at Fig. 35 indicates the form of a background stamp which may be filed from tool-steel or from a large wire nail (Metal - Working). Several forms of stamps can be purchased of any large dealer in hardware or special metal-workers' tools.

Fig. 36

Another method of treatment is to carve only the outlines, then tint the decoration with water-color or diamond dyes.

Now cut a strip of leather $\frac{3}{16}'' \times 4''$, knot one end of it, and starting with the upper hole thread it through, bringing it out through the next hole, then under again and back through the lower hole, finishing with a knot and completing the ring as it looks in Fig. 36.

Raffia or ribbon may be used in place of the leather strip.

Any of the previous designs in modeled leather may be adapted to carved work, and Fig. 23, the thistle design, from the naturally stiff and pointed character of the plant, would lend itself admirably to this treatment.

Turning to the extra designs given, Fig. 37, adapted from a South Sea carving, would naturally be treated as a carved design. An examination of Fig. 38 shows a number of small round spaces into which the modeling tools will readily fit, and the background may be roughened with the stamp.

The same is true in greater degree of the ship panel.

Enough has been said to show the possibilities of leather-work, and to explain the simpler processes of the craft. It remains for the student to go on from

Fig. 37

Fig. 38

MODELED AND PAINTED PANEL

Fig. 39

this and develop his or her own ideas, perhaps working out simple and artistic results by entirely different methods.

CHAPTER VI

BOOKBINDING

Forwarding, End Papers, Marking-up, Sewing, Gluing-up, Rounding and Backing, Cutting and Lacing-in Boards, Lining-up, Head-bands, Paring, Covering, Assistant Finishing, Finishing

CHAPTER VI

BOOKBINDING

THE modern revival of bookbinding in the spirit of thoroughness of the medieval craftsman, is engaging the attention of many amateurs at the present time so that no book on the art crafts is complete which does not treat of the subject to some extent.

To do the work thoroughly requires an equipment large and expensive in comparison with the other crafts, and to do it in a makeshift way is most unworkmanlike.

The best we can do with our limited space here is to give the student some suggestions for simple work such as can be performed by beginners, and

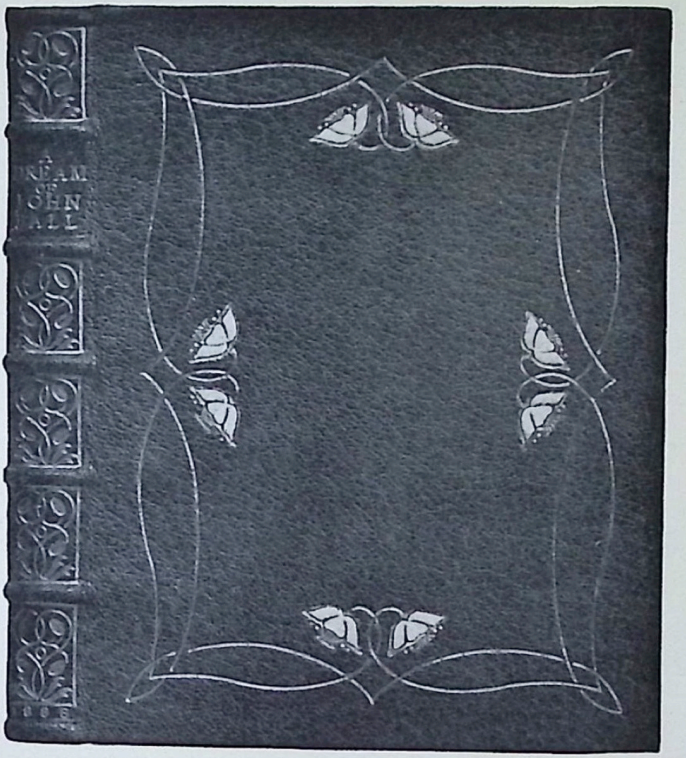
then to explain, as clearly as is possible in print, the "forwarding" and "finishing" of a book in the best method of the craft.

Let it be understood from the first that we are considering special binding in contradistinction to trade or commercial binding.

The directions that follow are as clear as words and working-drawings can make them; but the reader will come to a better understanding of each step of the work of bookbinding by taking apart an old copy of a hand-sewn book and comparing it with the diagrams and the printed instructions. A visit to a neighboring bindery will also prove of practical interest.

Magazines in general, particularly the ten-cent variety, are as a rule hardly worthy of the immense amount of time required to do special binding. If one's time is valued at anything one cannot afford to undertake the work when a commercial binder will bind, and bind well, for a dollar or less a volume.

On the other hand, if you have a first or old edition of some standard or really good piece of literature, in which paper, type, and other features are worth good binding, and which may need careful



DESIGNED AND BOUND BY MISS STARR

thought and patient mending, you may not care to intrust such a volume to the trade binder; and you may find it a labor of love to undertake the job of binding it yourself.

A simpler and less trying piece for a beginner would be a book obtained from the publishers in sheets, if possible. This will avoid any mending, and will allow one to start with the first step in binding, thus saving the work of undoing the original binding.

In selecting such a book good hand-made paper, correct margins, and satisfactory presswork in every detail should be insisted upon, and the subject-matter of the volume assuredly should be of intrinsic merit.

If we wish to emulate the craftsmanship of the medieval binders, nothing but the best material and most thorough methods will suffice.

For the special binding of books, at school or in the home, the following equipment (p. 178), which is kept as simple as possible, will be required. In some cases ingenious and efficient substitutes may be found to take the place of articles named. Any article on the list with which the reader is not already familiar may be obtained at any bookbinder's supply store.

Sewing-frame (Fig. 5).
Pressing-boards.
Backing-boards.
Tins for pressing.
Celluloid sheets.
Letter-press (ordinary office press).
Finishing-press.
Lying- or cutting-press.
Plow.
Carpenter's square.
Dividers.
Straight edge or metal ruler.
Awl.
Backing-hammer (Fig. 12).
Paste-brush.
Ivory or bone folders.
1 ordinary cutting-knife (see LEATHER-WORK).
2 knives for paring leather (Fig. 15).
Band-nippers.
Band-stick.

Knocking-down iron, also used as weights for less heavy pressing. The actual k–d iron cannot be had in this country: a handleless flat-iron or other substitutes must be used.

Forwarding a Dummy Book.—By "forwarding," in bookbinding, is meant all the steps toward the completion of a book, up to, but not including, "finishing," or the lettering and decoration of the same.

A wise and eminently safe beginning in bookbind-

ing is to practise first on a dummy or blank-book. This may be planned, as to thickness and dimensions, to meet the requirements of a journal, guest-book, or scrap-book, as the case may be. The quality of paper used will depend, of course, on the nature of the book. Ordinarily, you will do well to select a medium-grade cream or white and a medium size paper. Artist's charcoal-paper is excellent. These sheets will be possibly eight times the size of the book determined upon. Now carefully fold and cut once, then refold and cut each half until double the size of the final page is obtained.

Sections will be made up of from three to eight folded sheets, depending on the weight and bulk of paper, and as many sections used as may be desired.

A book of medium thickness is somewhat easier to handle, as well as more quickly sewn.

These sections, with the "end-paper" sections, must now be pressed between pressing-boards and tins, in the letter-press, preferably over-night.

End Papers.—The "end-papers" are blank sheets occurring at the front and back of the book, and are not only a protection to it, but also help to give it a respectable appearance, and should be generously allowed for.

Always three or four end-papers, not counting the paste-downs, are to be found at either end of a book, and are prepared as follows:

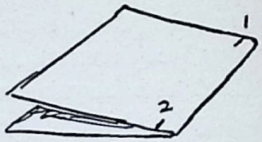


Fig. 1

Take two carefully folded sheets of paper slightly larger than the book, mark them with dividers, $\frac{1}{8}''$ from the back, near the top and bottom (Fig. 1), and paste the second folded sheet to the first as far as these points (Fig. 2), and then press.

When the paste is quite dry, fold A1 back over B1, and A2 the reverse way, when the sheets will appear as in Fig. 3. Another folded sheet is inserted at P, and the sewing passes through this, as well as through P1.

When the paste-down B1 is to be pasted down to line the inside of the board, the waste A1 is torn out. This joint, known as Cockerall zigzag, is necessary to give a spring to the board and to prevent its tearing the end-paper away from the book. These

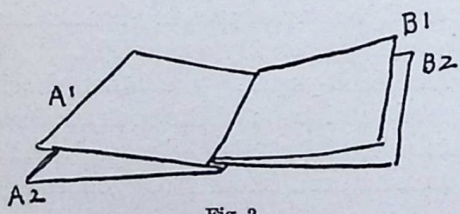


Fig. 2

two sections of end-papers must be pressed with the book before sewing.

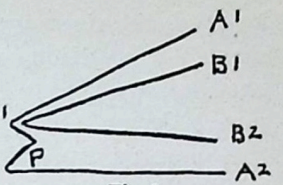


Fig. 3

Marking-up. — "Marking-up" consists in determining and marking across the back of the sections the position of the sewing-cord.

These are usually five in number, though they vary with extreme sizes of books, at the discretion of the binder.

Divide the back of book with dividers (beginning at the head) into six parts—five equal ones, with that at the tail slightly greater. Having determined the position of the cords, draw heavy pencil-lines across the back, marking every section.

Mark the position of the kettle-stitch (or catch-stitch) about half an inch either end (KK, Fig. 4). These are sawed or filed in to a depth of about one eighth of an inch.

Sewing.—A sewing-frame such as has been used certainly since the sixteenth century, and probably earlier, is shown in Fig. 5, and is still in use.

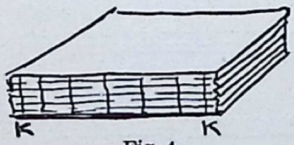


Fig. 4

The best hemp cord should

be used, the size varying somewhat according to the size of book. Five cords are now tied to A and fastened below B, on a special key made for that purpose. Or, as the keys are not easily obtainable in this country, a good-sized nail may be used, around which the cords are twisted and firmly tied (Fig. 6).

Now adjust the cords to correspond to the marks on the book, and tighten them by screwing up the cross-bar (Fig. 6).

The book will now be sewn, beginning with the first section, which is laid face down, head to the right, back against the cords on a pressing-board which is larger than the book, and which raises the section from the bed of the frame and lessens the difficulty of inserting the needle.

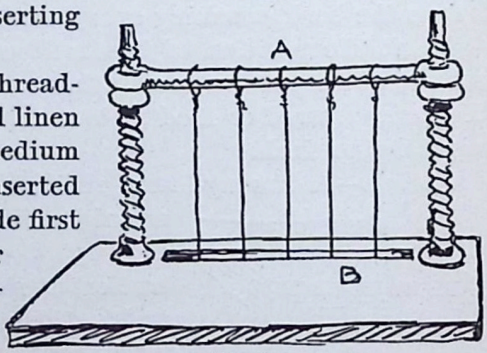


Fig. 5

The needle, threaded with a good linen or silk thread, medium weight, is inserted from the outside first at the nearer right-hand kettle-stitch.

An end of, say,

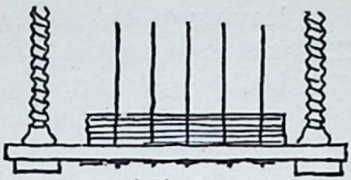


Fig. 6

two inches is left at this first kettle-stitch, to tie to later, and the rest of the thread pulled through.

The needle is now in the middle of the section and will be passed out at the left-hand side of the first cord, the thread pulled taut, and the needle inserted again into the hole out of which it came, but from the opposite side of the cord, and so on around all the five cords, and finally out at the kettle-stitch at the foot (Fig. 7).

The next section is laid on and is sewn from foot to head, similarly, after which the thread is tied to the loose end left at the first kettle-stitch. The third section is then laid on and sewn, but when its tail kettle-stitch is reached, the under thread connections, sections 1 and 2, are tied too, as shown in Fig. 8.

This kettle-stitch is repeated at each end throughout the book. When the last end-paper has been sewn on, a double kettle-stitch is made, which completes the sewing. The cords may now be cut off,

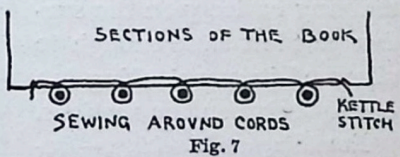


Fig. 7

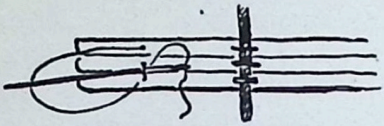


Fig. 8

leaving about three inches on each side of book, for fraying and later lacing into the boards.

Gluing-up.—For this operation the best cabinet-makers' glue is used, prepared in the usual way, having been soaked overnight and shortly before needed cooked in boiling water to a smooth, clear, rather thin consistency.

A large brush of good quality is used. The book is knocked up squarely at the back and head, put between two pieces of millboard or old cloth covers, covering the cords, and screwed up in the lying-press, exposing the back only (Fig. 9). Hot glue is now daubed thoroughly on to and into the back of the book. The press must not be screwed so tight as to result in the glue remaining entirely on the surface, nor left loose enough to allow of its penetrating too deeply between the sections.

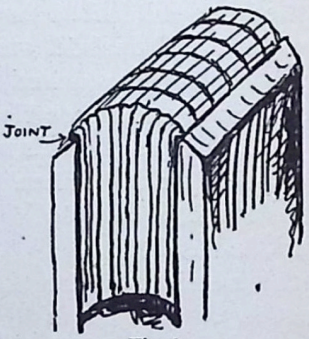


Fig. 9

Rounding and backing.—Be-

fore the glue has hardened, but after it has ceased to be "tacky," the book is removed from the press and rounded, during which process the back is curved slightly and evenly.

The degree of curvature will depend upon the natural disposition or tendency of the book, and partially as well upon the taste or wish of the binder.

All books will be rounded somewhat, to prevent the possibility of their later becoming concave.

Rounding consists in drawing the sections over and tapping slightly with a hammer, first on one side of the book and then on the other, resulting in an even convex form at the back and a correspondingly concave form of the fore edges of the book.

In Backing a book the rounding is completed, made permanent, and the book given a firm, smooth back. A backing-board is placed on either side of the book, back from the edge, just the thickness of the boards.

This projection of the book will cause a joint, into which the boards should just fit. In placing boards and arranging for screwing up in the press, firm handling, endless pains, and no little patience are required.

Frequently one or both boards slip, leaving a greater projection of the book at one end or side; this must be carefully avoided.

When the book is ready, screw the press up very tight. With a back-hammer—and it should not be a heavy one — proceed gently and cautiously to start the sections in the right direction, bringing them over from the middle each way. Then with heavier, firmer strokes go over the entire back, taking care that the joint is as sharply defined as possible. Fig. 9 shows the rounded back, and the joint is indicated by the arrow.

Cutting and Lacing-in Boards.—A good, firm millor tar-board should be used for cover-boards. Both come in several thicknesses, from which the binder will choose, according to the size of the volume in hand.

First cut the boards roughly to size of the book, allowing, say, one inch beyond.

Plow.—This is the binders' cutting-knife, which is now employed to obtain the exact size and perfectly clean-cut, smooth edges. The two boards are placed in the cutting-press against a piece of stiff millboard, or against a piece made by pasting together two or three thinner pieces of millboard.

The plow (with plough-knife extended about 1″ and screwed in) is placed in the groove of press provided for it, held by the hand and screw, and run slowly and smoothly backward and forward; a slight turn of the screw brings the knife forward. When the two thicknesses are cut through, remove the boards and line them.

Lining-up.—With a piece of common white paper, line one side of each board.

Paste Formula.—A good paste may be made to use for bookbinding purposes, as follows: ½ pound of flour (two cups); 2 teaspoons of alum, dissolved. Mix the flour with a little cold water, getting the lumps out with the hands. Add 8 cups of hot water and boil, stirring constantly. This becomes partly clear when done. Add ½ teaspoon of essence of wintergreen and sassafras, which helps keep the paste sweet.

The paste is to be used cold, and applied with a large brush. Cover the lining-papers evenly, and as thinly as possible. Place on the board to be lined, and rub perfectly smooth, using the palm of hands and folder.

Be sure to have both the inner and double lining-papers pasted down uniformly and perfectly smooth.

The lined covers should be pressed for a few moments only, and then stood up to dry.

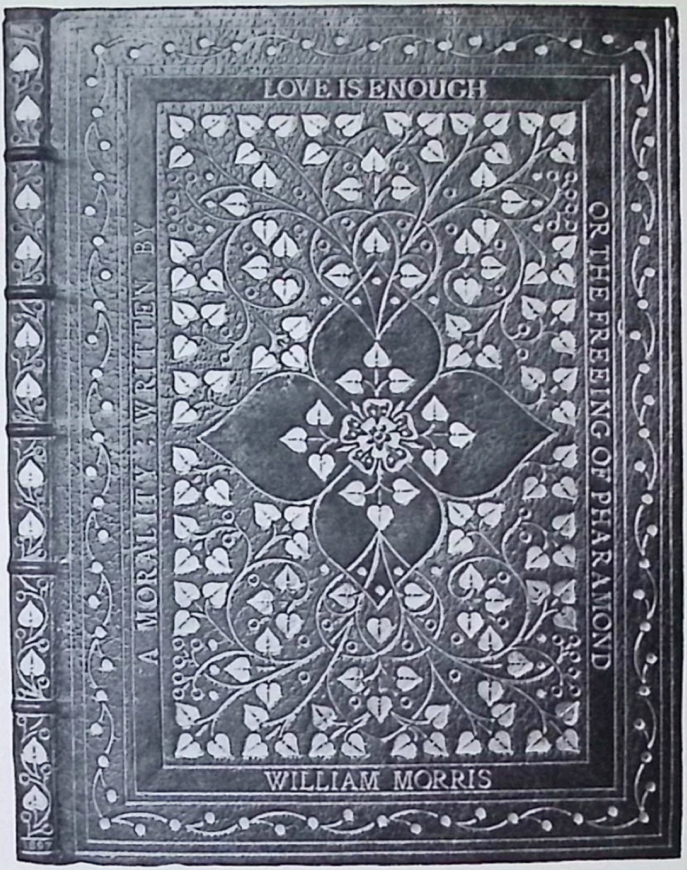
Now if the boards are dry, continue cutting them in the plow down to the size of the book. Decide upon the square or projection of board beyond the leaves of the book, usually $\frac{1}{2}''$ or less if the edges are plow-cut; more if they are rough or deckled.

Mark this square accurately, using dividers and try-square. Place in the press with double linings together, and cut to the marks with plow.

Test again with the try-square, and by reversing the position of boards; then mark and cut the remaining sides. When perfectly square, and of the required size, place the boards on the book in their final position, hold firmly in place with the left hand, and with the right mark accurately the position of the cords on the back edge of the board.

Lacing-in Boards.—Remove the book from the press and finish fraying or thinning the cords. Use a knife for thinning or reducing the cords equally, but leaving them strong and long enough to hold the covers on to the book.

Mark both boards, and then cut accurately a V-shaped groove or depression back to a line drawn



DESIGNED AND BOUND BY PETER VERBURG

about $\frac{1}{2}''$ from the edge of the board (Fig. 10). Into these depressions the cords will fit.

With hammer and awl two sets of holes are punched—the first set at the point of the V-shaped cut, and the second just above and inward from the first (Fig. 10); these last to be punched from the under side of the board at a slight angle.

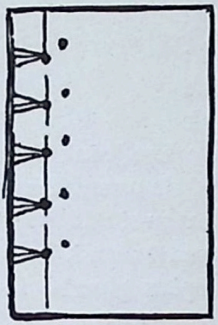


Fig. 10

These holes must be only just large enough to allow for inserting the cords, which are now smeared with paste and twisted to a point.

Lace on one board, inserting the five cords into the first set of holes (Fig. 11, *a*). Draw the cords through firmly, and return them through the second set at *b*.

The board should close down to the book stiffly if the lacing is snug enough. Lace in the other board, then tap the cords slightly with a hammer to prevent their slipping, and cut off the ends with a knife very close to the book.

A knocking-down iron (Fig. 12, A) is placed in the cutting-press and the lacings or cords hammered

vigorously, matting them into the boards and leaving a smooth surface inside and out (Fig. 12).

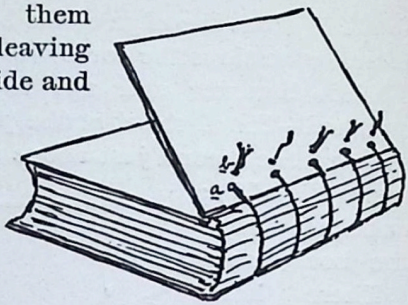


Fig. 11

The book must now be pressed. Put a tin inside and outside of each board: the ones between the board and the book pushed quite up to the joint, and the outside tins placed up to, or a little over, the same.

While in the press paste is applied to the back of the book and allowed to soak in for a few minutes. This softens the surplus glue so that it may now be scraped off with a palette-knife or a piece of wood.

Leave the book in the press over night at least, after which it is ready for the head-bands.

Head-bands.—Cut two narrow strips of vellum, not quite as wide as the projection of boards, and about an inch longer than the book is thick. These are to be buttonholed with silk upon head and tail of the book at the back.

Stand the book in the finishing-press (Fig. 13), v indicating the position of the vellum. Thread a

needle with medium-heavy silk thread or floss and sew in the direction of the arrow, through the first two white end-papers, the needle coming out at the back of the book below the kettle-stitch. Come up over the vellum and repeat this first stitch, in the same place making a loop of silk over the vellum. The silk is pulled through the needle half and half, one half being now at the back of the book and the other half in front, on top.

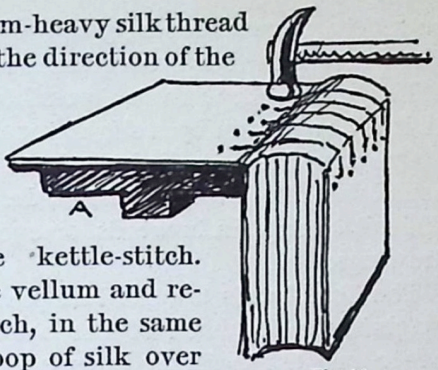


Fig. 12

Bring the thread from the back forward, and that from the front backward, crossing the other and passing under the vellum and forward again. This makes a buttonhole twist covering the vellum. Repeat, keeping the threads taut and the stitches close together, and the beading even and regular. At frequent intervals—about every half inch—the book is again sewn into below the kettle-stitch.

Finish the head-band, when the last section is reached, by sewing down between the last end-pa-

pers, tying threads securely at the back of the book. Then cut off the surplus vellum and thread.

The silk is kept from a possible slipping off the ends of the vellum by a slight touch of paste.

One must have studied the head-bands of a hand-bound book to know the effect desired, as it is most difficult to explain in words, or even with the aid of drawings.

The head-bands are held in place and reinforced by gluing to the back of the book a piece of good paper cut just to fill in the space between head or foot and the nearest cord, and just the width of the book.

Preparing for Covering.—After sandpapering away any possible roughness which may have been left from the glue or from other causes, and cutting off a tiny triangle from the four back corners of the board (Fig. 14), the book is ready for the leather.

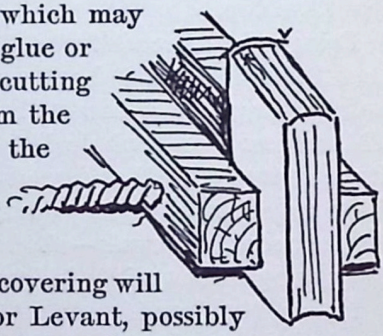


Fig. 13

The leather used for covering will probably be Morocco or Levant, possibly Niger. In any case the first quality should

be used, and as some experience is required before one can become a good judge of leather, he will do well to patronize only a thoroughly reliable dealer.

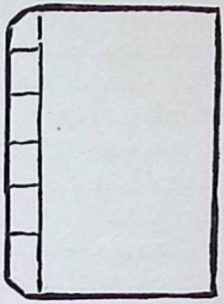


Fig. 14

The skins may be purchased already pared little or much.

It is dangerous to get one too thinly pared, for though it lessens the labor of the binder, it certainly weakens the leather.

Better select a thicker skin and do the necessary paring where it is required, particularly around the edges and also through the center portion which is to cover the cords or back of the book and for this reason must be thin and flexible.

Paring.—A lithographers' stone is convenient to pare on, though a marble-topped table, if you have one, will do nicely.

Various paring-knives are shown by the dealers, and binders use different styles. I recommend a small saddlers' knife, such as is shown in Fig. 15, and this must be kept very sharp.

Cut from the hide a piece of leather large enough to cover the entire book in hand, allowing an inch

on all sides for turning in; and pare the whole edge for an inch at least, inward.

It should be very thin at the extreme edge. Coarse sandpaper may be used to good advantage after a very little paring has been done, especially in the middle part of the leather, working from top to bottom.

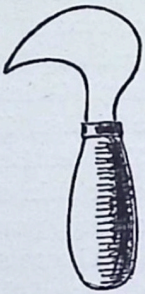


Fig. 15

Covering.—Whatever is to be used in the work of putting on the leather should be at hand before the covering is started, including paste, brush, pasteboard, folders, nicked band-nippers, band-stick, clean cloth, folders, sponge, a little water in saucer, and celluloid or waterproof sheets the size of the book.

The leather is now covered uniformly with paste, which must be smooth and perfectly free from lumps.

The back of the book is placed in the center of this pasted leather, the inch margin left at head and foot. Bring the leather up on the sides, pull slightly, and rub perfectly smooth with the palms of the hands or bone folders.

Stand the book upon its fore edge and nip up the bands with the band-nippers, working down the

leather between the cords with the band-stick—a bit of smooth, hard wood with straight edges.

Much time and pressure are required in this operation, and we shall return to it later. Before the paste is too dry the leather on the head and tail must be turned in, and then the leather on the fore edges, and the corners mitered. Especial care must be taken to have a sharp, smooth edge.

At the head and tail a little paste will be needed on that part of the leather which will turn in behind the head-bands.

This fold of leather behind the head-bands is brought forward slightly and tapped down to form the head-cap, partly concealing the head-bands.

Now open the covers one at a time and cut off the extra leather at each corner, tucking one edge neatly under the other.

Insert the celluloid sheets between the covers and the book, to prevent dampness being absorbed by the latter. Close the volume and stand it on its fore edge, holding it firmly while the process of nipping up the bands and smoothing down the leather between them is completed.

A piece of cord is tied around the book at the back (Fig. 16), causing the leather to adhere tightly,

and accentuating the joint caused by the slight cutting away of the corners at the back. The book is now left under slight pressure until perfectly dry.

Assistant Finishing.—Trim the leather neatly to an even margin on the inside of the covers, tear out the waste end-paper, and line the board with the "paste-down" provided in the end-paper section.

Finishing.—The decorating and lettering is usually done by means of tools; and the process is technically known as "tooling."

These finishing-tools are stamps of metal held in a wooden handle.

A unit of a design, letter, or other device is cut in this tool-metal (Fig. 17). Tooling may be either blind or gold; the first consisting of the mere or blind impress of the tool upon the leather, while in the latter, as you may infer, the gold-leaf is added.

The possibilities of tools—their use in most elaborate combinations and designs—is very great, but I shall undertake to describe only the simplest method of finishing a book in this way, and the steps involved.

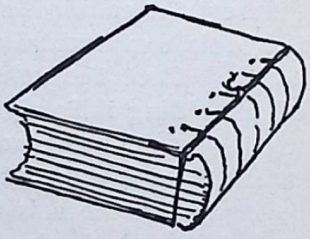


Fig 16

Tools.—At least two sizes of letters, both caps and lower-case, must be owned by any finisher.

Fillets, or wheels on handles, for making lines, several gouges or curved-line tools, as well as a few simple units, such as dots, leaves, or other standard forms, may be purchased at first, and later added to with tools of one's own design, cut to order as they are needed.

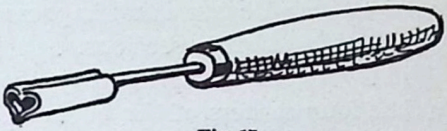


Fig. 17

For the book in hand only three tools (besides letters) are required: the fillet, a small leaf, and tiny gouge.

It is a small volume and thin—so thin that the title cannot go comfortably upon the back; hence I must decide where to put it on the side and plan the decoration with reference to this panel of lettering.

No more simple scheme could be devised than that shown in Fig. 18 with the panel of lettering across the top, and an "all-over" pattern filling the remaining space. Diagonals are first drawn and the leaf, with the tiny gouge forming the stem, placed at each intersection. The title is in gold and the rest in blind-tooling.

A piece of thin bond-paper is cut just the size of the book, and upon this the panel for lettering is planned, border lines and diagonals drawn.

The leaf- and stem-tools used are slightly blackened in a candle flame and impressed upon the paper at the diagonal intersections.

This pattern is then lightly pasted to the leather at the four corners of the book, and the heated tools applied. Tools are heated on a finishing-stove or iron frame which will support them near a gas or other flame.

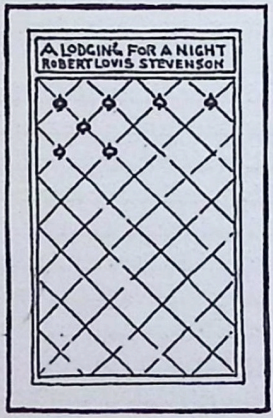


Fig. 18

A wet sponge in a dish is used as a cooling-pad, and upon which the hot tools are tested. They should hiss slightly and should be too cool rather than too hot, as the impression may be deepened after removing the paper.

The title to be finished in gold must be painted in "glaire."

Finishers' glaire is made by beating well the white of an egg, which is then diluted

with half the quantity of vinegar and allowed to settle. The cover is then washed with thin paste-water, then the glaire is applied to the blind impressions which are to be covered with gold with a small finely pointed brush. When glaire has ceased to be "tacky" the gold-leaf is laid on.

Gold-leaf may be purchased in booklets containing a dozen or more small sheets. Only the best quality should be used.

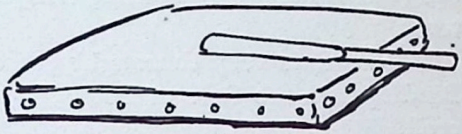


Fig. 19

Gold-leaf is difficult to handle—almost impossible if there is any draft present or grease on the cushion or knife (Fig. 19).

A strip of gold-leaf as wide as the letters are high and long enough to cover three or four is cut on the cushion of chamois-skin (Fig. 19) and transferred by means of a bit of slightly oily cotton to the letters.

The heated tools are again applied over the gold. Before using any tool it should be rubbed off on a strip of leather provided for this purpose, to insure cleanliness and to polish the end slightly.

Often two or three or four thicknesses of gold are

required before the pattern, or in this case the letters, are uniformly covered.

When the tooling is finished and the surplus gold removed with a bit of cotton the book may be washed with benzine to remove any grease or soil.

This completes the processes without going into more complications.

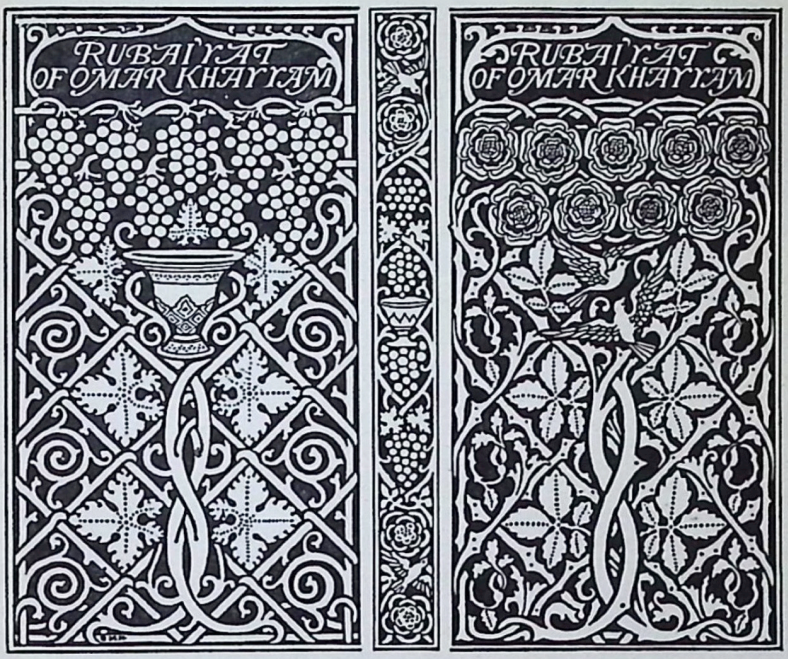
The reproductions of work here given illustrate the possibilities of combining simple units into patterns.

The craft is very thoroughly discussed in "Book Binding and the Care of Books," by Douglass Cockerell.

Other books of interest to the amateur binder are:

"Book-Binding." Hone.
"Book-Bindings — Old and New." Matthews.
"History of Book Binding." Brassington.

Turning now from the constructive or craftsman side of bookbinding to the esthetic or fine-art side, we find that, broadly speaking, there are two schools of designers. On the one hand we find those who hold that the binding of a book is a thing of beauty, complete and satisfying in itself, just as a picture is



COVER BY BLANCHE MCMANUS MANSFIELD

complete,—a thing designed without necessarily having any reference to the subject-matter of the book; and, on the other hand, we have those who believe that the decorative motive of the cover should be subordinated to the character of the contents—like a page standing, as it were, without an entrance and wearing the livery of the master within.

The beautiful bindings of Miss Starr and Mr. Verburg here shown are of themselves excellent in design and workmanship; whether they typify the highest art of the craft or not is to revive the old, old controversy between the idealist and the realist —abstract beauty or concrete development of character.

CHAPTER VII

SIMPLE POTTERY

Clays Suitable for Pottery, The Chief Tools, Method to be Followed in Molding, Decorative Treatment, Kilns

CHAPTER VII

SIMPLE POTTERY

BECAUSE of its flexibility and simplicity as a means of art expression, because of universal use of its product, and from the fact that in its almost identical present form it was one of the important occupations of primitive man, the art of making pottery lays claim to our interest.

It was when he had discovered (so tradition tells us) that the clay which had formed the bed of his fire was baked into a hard bowl-shaped object which could be lifted about, that the idea of making fire-baked pottery first came to the mind of prehistoric man. Later, when sand, accidentally present in his material, melted in course of the baking and ran down the sides of his vessel, he first conceived the notion of glazing it.

To the discoveries thus accidentally made ages ago, no essentials have been added. The potters' wheel facilitates the building of forms; the process of casting makes possible the absolute reproduction of them. Experiment and scientific research have put into the hands of the potter such control of his material that he became able to procure any quality of ware, from that of the commonest flower-pot to that of the finest china; but it is a truth that among the primitive races of the earth to-day pottery is being produced which is equal in its artistic qualities to the product of the best kilns of the civilized world. Therefore will it be seen that the processes involved and the materials employed in its manufacture must be comparatively simple and accessible.

Clay is decomposed rock, containing, in addition to those materials which give it substance, quantities of water both in mixture and in chemical combination. Water in the former state can be separated from the clay by heating the mass to the boiling-point of water—a process after which the clay, though dry, is capable of being restored to its original condition. The water which is with the clay in chemical combination can, however, be removed only by ignition—a process commonly called baking or "firing." After

COILED AND DECORATED PATTERN
(Work of Chautauqua School of Arts and Crafts)

being fired, clay cannot be restored to plasticity. Its value in the manufacture of pottery is, of course, due to this fact. Some clays, to be fired, require a greater heat than others; these are called "hard clays" and the process "hard-firing." As this chapter has to do with the use of pottery as a means of art expression rather than with its more deeply technical phases, we will consider here the treatment of soft clays only—such as require for burning and decoration but one firing in an overglaze (soft glaze) kiln. The kilns commonly used for firing china decoration will fire these soft clays.

Clays suitable for pottery may be found in any of the common earths having a considerable plastic quality. The process of separating the clay from the other earth matters is simple. The earth is pulverized and dissolved in water. Stones and heavy particles will sink. The milky fluid which remains—water mixed with clay—may then be drawn off and allowed to settle, the clear water finally collecting on the top. This can be removed by a siphon. A repetition of this process will refine the clay.

In certain localities, clays will not be found in sufficient quantities or of suitable quality to warrant the above process; and potters' clays can be purchased

at the rate of one or two cents a pound "in the dry."

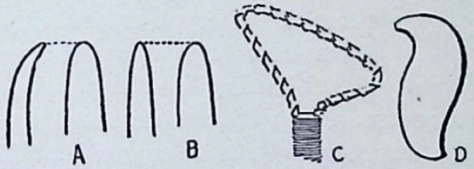
Clays in the dry come as a fine grayish or yellowish powder. To prepare these for use it is of course necessary to mix them with water. This is done by putting about equal quantities of clay and water into a basin and allowing to soak for ten or twelve hours, after which the mass must be kneaded thoroughly so as to become of a uniform moisture throughout. Kneading also works out air-bubbles, which if allowed to remain in the clay would permit the generation of steam in the firing, causing explosions fatal to the work. In this connection, then, it may be said that *clay cannot be kneaded too much.*

If clay is found too wet for satisfactory work (and its proper consistency will be speedily discerned by the person handling it), the superfluous moisture may be worked out over a dry-board or a plaster-of-Paris bat. This is made by pouring plaster of Paris, to the depth of half an inch or so, into the bottom of an oiled pan. The bat is also useful as a bed upon which to build pottery.

When the clay proves to be too cohesive,—that is, not "short" enough for use,—the proper condition can be brought about by the addition of fine sand. Clays

which are not tough enough, but inclined to crumble in the handling, can be made more cohesive by the addition of tannic acid, but they will hardly repay the trouble.

The chief tools for clay-working are the fingers. There are wooden tools, such as shown in cuts A and B, partaking of the character of the fingers, which are occasionally useful for making incisions for decoration, etc. These can easily be made out of any



fairly hard wood. Other shapes may suggest themselves. At C is represented a loop tool which can be made of a piece of large iron wire and twisted with a finer wire. This will often be found useful for scraping off superfluous clay where the thickness of the work in hand has become too great. The presence of the finer wire makes control of the tool more easy. The drawing at D repreents a tool made of a piece of spring steel, cut

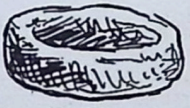
so as to present a variety of edges. It will now and then be useful in securing more regularity of contour in a model. It is, however, always well to bear in mind that a vessel which, while possibly just missing absolute symmetry, bears the stamp of thoughtful hand-work will usually have more character than one made exactly true by mechanical devices.

THE LUMP
Fig. 1

It is hard to lay out any particular method to be followed in molding a piece of pottery, but for such as are at a loss how to go about it we suggest the following course of procedure:

First, of course, start with an idea, and work upon that. It is most strongly to be urged that the educative value of the work, and indeed the very success of it, is in a large measure dependent upon the worker's having some definite conception to follow out.

Beginning with a lump of clay about the size of a small orange, and of a free and plastic consistency, first model what is to be the base of the proposed bowl or vase form (Figs. 1, 2). Making this rather heavy and thicker than the proposed vessel is to be,



THE BASE
Fig. 2

we have a rude, somewhat hollowed hemisphere or "nest" (Fig. 3). Upon this we build the sides, adding pieces of clay spirally, pressing firmly together with the fingers, and using the utmost care to preserve uniformity of thickness (Fig. 4). As our hands become more accustomed to the clay, effort will become less noticeable and the object will seem more and more to grow of itself. The tendency should be always to keep the work substantial, as clumsiness is a safer fault than too great delicacy, it being more easy to remove extra thickness than to add it. Of course there will be failures: sometimes a vase form nearly complete will fall—a catastrophe wholly without explanation until we discover that in the fever of inspiration we have permitted a wall somewhere to become too thin, a horizontal plane too extensive, or a part of our clay too moist. Accordingly we keep watch against a recurrence of this by building with one hand inside, withdrawing one

THE NEST
Fig. 3

THE COIL UPON THE BASE
Fig. 4

finger at a time as the orifice at the top becomes smaller. Experience will show us things we have not dreamed of—that with the clay more moist the tendency to sag will become more manifest; and again, that as the clay finally dries shrinkage enters among the influences playing upon the form. Certain shapes will be found impracticable; we will discover, in short, the limitations of our medium. It is the true artist who, carefully considering these and adapting himself to them, turns them into advantages.

THE COMPLETE FORM.

Fig. 5

During the entire process of building, the work must never be permitted to dry out. It must be kept covered with moistened cloths when work is not going on.

When the greatest desired diameter is reached, the model may be inverted upon the bed and the too great irregularities in its contour removed. At this time, too, the superfluous part of the original "nest" may be scraped down and the desired form of the base worked out (Fig. 5).

The adding of spouts and handles scarcely needs notice here. Hollow spouts can be modeled about a straw or any other material which is stiff enough to support the clay while light enough to burn out in the firing. In the designing of spouts and handles the idea of solidity should still be kept in mind, and it would be best not to attempt such as stand far from the body of the vessel without firm support. This principle is true in an esthetic as well as a practical sense; indeed, the addition of these parts gives a fine chance for the exercise of the artistic judgment, as they may be considered as much a part of the decoration of the whole vase as the designs which are to be later scratched or painted upon it.

Of the various kinds of decorative treatment for pottery, the simplest is line incision (see specimens I, II, and III of Arizona Indian pottery). This had best be done with one of the wooden finger-shaped tools described above, that the technic may not be out of keeping with the modeling of the vessel itself. Judgment and taste may be brought to bear in the matter of depth of the lines, that being in some measure dependent upon the thickness and the uses of the vessel. As in the other branches of the crafts, restraint rather than lavishness is here

recommended, and a few experiments will teach more than dozens of paragraphs.

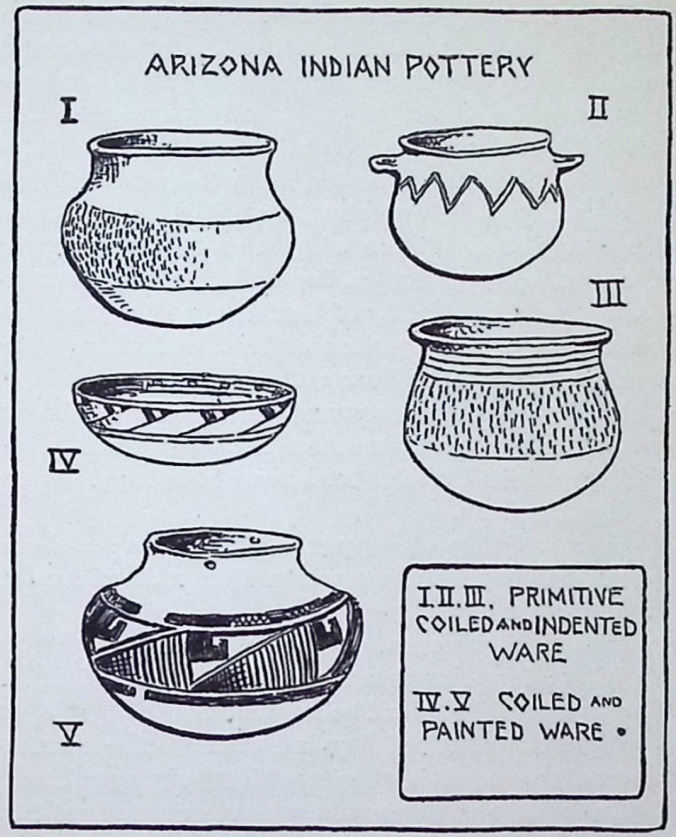
Endless variations of mere line treatment will suggest themselves—lines used alone, lines bounding spaces, combinations of lines for the treatment of surfaces, or a combination of line incision with the use of color. The examples by Arizona Indians here given cannot be improved upon artistically. One sees at once the crude, uneven outlines, but feels that the stippled and incised decoration is applied to the best advantage. And in the more elaborate decorations (Figs. IV and V) a correct sense of proportion is shown which, whether a matter of instinct or of careful thought, is truly admirable.

As the purpose of this book is to treat the crafts in a simple way, we have not touched upon wheelwork or casting, believing that the hand-molding offers a sufficient artistic field for the amateur and the young craftsmen in the schools.

The methods of treating pottery as distinguished by the appearance after firing are:

(1) Those which leave the surface comparatively dull and porous.

(2) Those which give the surface a coating of fused matter known as glaze.


ARIZONA INDIAN POTTERY
I
II
III
IV
V
I.II.III. PRIMITIVE COILED AND INDENTED WARE
IV.V COILED AND PAINTED WARE.

For obtaining either of these effects the colors used are the same, being the ordinary substances which are used for the color principle in the manufacture of all manner of artists' pigments—i.e., colors in their raw or "green" state. These colors come in the form of powder, and must be combined with a liquid in order to be applied to the clay. This may be a solution of gum arabic in water, of the consistency of cream, the addition to this mixture of a small quantity of dextrine making it more adhesive. A list of colors quite broad enough for the average reader follows:

Reds: Raw sienna, a warm yellowish red; burnt sienna, a deeper red; maroon, a claret-brown.

Blues: Cobalt, a color too strong to be used alone; Indigo, Prussian.

Greens: Oxide of copper, a blue-green; a dark green may be made by a mixture of oxide of copper and potassium.

Yellow: Raw sienna.

White: Pipe-clay is a favorite substance with the Indians for a dull, dead relief white.

Slip is a mixture of clay and water to the consistency of cream. It is often used in applying color.

An inside glaze is necessary to vessels designed to

hold liquids. There are several substances particularly suited to this purpose. Red lead, which in the form of a powder can be dusted upon the moist clay, is one; it will fuse in the firing.

Marsching's soft Limoges glaze is designed for such purposes.

The simplest method of coloring pottery without the use of a glaze is to apply the color, mixed with gum arabic and water, to the moist surface of the clay. The vessel is then put aside for two or three hours to allow the color to set. Before the clay hardens, however, the color must be well worked into it with some smooth instrument: the back of the bowl of a spoon may be used, or a polished hardwood tool. The rubbing will impart a gloss to the surface, which is unchanged by the firing. After the color has been applied, the pottery must be set aside for two or three days in order that it may dry thoroughly before being fired.

So different are the various kilns that no definite information can here be given concerning them. As stated above, a simple overglaze kiln is sufficient for all processes discussed in this chapter, and almost every town will afford at least one of these, the use of which may be secured by the amateur craftsman.

For schools which include pottery in their curriculum, overglaze kilns using kerosine oil for fuel may be purchased at a cost ranging from thirty to two hundred dollars. Full instructions for their manipulation should accompany them.

After the pottery has been colored and fired, a simple design may be carried out by scraping off the surface color so as to expose the original grayish or creamy-white tint of the clay.

A second method of coloring is to mix the pigment with the body of the clay from which the model is to be built. Still a third way is to color the vessel all over, or in design areas, with colored slip. A colored slip is a solution of the clay and water mixed to the consistency of cream, to which color has been added.

Such unglazed pottery as we have been discussing may be refined after firing by rubbing floor-wax on the outer surface. This fills up the pores and gives a more uniform quality to the whole.

For the successful glazing of pottery, at least two firings are necessary. A formula for glaze is to be had manufactured in a powder, which is mixed with the color, and fuses with it. Soft glazes, such as can be fired in an overglaze kiln, may be purchased of

any potter. Their composition is usually kept secret. One part of dry color mixed with nine parts of dry glaze, the whole to be dissolved in a solution of gum arabic and water, will result in a medium tone of that color. Such a solution is applied by means of a No. 8 camel's-hair brush to the surface of a piece which has been fired once. The color should be laid on with the flat side of the brush without drawing the brush upon the surface. Be sure to cover the form evenly. Allow the color to dry, after which apply a second coat in the same manner.

Pottery offers so much opportunity for personal experiment, that no set of rules can be made to cover the entire field. Every worker makes discoveries, finds new ways of working. A careful record should be kept of every experiment. Note the kind of clay and its condition, and the mixture and quantity of color, the degree of heat in firing, and the place occupied in the kiln. The piece should be marked in some way, so that reference can be made to the record. Do not trust to memory for any of these items. It sometimes happens that an excellent bit of color or technic is secured, and a repetition of the same is impossible because all the conditions have not been remembered.

A room equipped with potter's materials—which include a kiln, so that the process of forming, coloring, and firing is wholly under the control of the worker—constitutes a condition very nearly ideal.

CHAPTER VIII

BASKETRY

A Reed Mat, Small Reed Basket, A Basket with Triple Twist, A Coiled Basket, Lazy-squaw Weave —Sewed Basket, Samoan Weave, Plant-basket, Work-basket of Green Reed, Fruit Basket of Cattail-leaves, Raffia Basket in Bam-tush Weave.

CHAPTER VIII

BASKETRY

NO work on the crafts is complete without a chapter devoted to the primitive art of basketry.

The durability, cheapness, and lightness of the material, and the ease with which a knowledge of the weaves may be acquired, all commend it to the beginner.

But before commencing a detailed description of the weaves it may not be out of place to devote a few paragraphs to this art as practised among the primitive Americans, from whom we derive much of our knowledge.

That basket-making is the oldest as well as one of the commonest and most useful of the domestic arts is now generally conceded.

The first use made of the basket was probably as a

cover for water-gourds, to protect them from being so easily broken when the early tribes moved from place to place.

In time the basket became not only the commonest domestic utensil, but its use was extended to all social and religious functions.

The ever-faithful and industrious Indian woman often worked for weeks, and sometimes for months, on a single basket; her expert fingers not only wove a mechanically perfect basket, but she has shown a knowledge and appreciation of the beautiful in form, color, and design that fill one with astonishment and admiration.

At the present time many persons are satisfied if useful articles are cheap, and give no thought to their beauty; not so the aboriginal woman: she wove her joys and sorrows, her hopes and fears, into her baskets.

They were the art expression of the people, their poetry and religion.

Even among the Nubians who live in rude huts on the banks of the upper Nile, we find baskets of most artistic form, beautiful design, and delicate coloring.

At present there is a strong effort being made by those interested in the restoration and preservation

of Indian art to have the people return to the use of their vegetable dyes.

Every one who uses any basketry or weaving materials can help in this if they will, as far as possible, refuse to use any that are aniline-dyed. Vegetable-dyed materials give softer and more durable colors, and, if properly done, will not discolor the fingers while they are being woven.

Our study of the industrial arts of the Indians has led to a better understanding of the character of the people, as well as of their customs and occupations. They are highly imaginative, and a world of legendary lore is expressed through their baskets.

One legend woven into the baskets used for carrying infants on the mothers' back has it that the first boy born was wrapped in a black cloud; a rainbow, studded with stars, was represented by the hood of his basket; the back part was a parhelion; zigzag lightning was on each side of the top and the fringe, and straps signified sun-beams.

So into everything they made this imaginative people wove some fanciful story.

The materials used in modern basketry are principally reed or rattan, raffia, corn-husks, splints, and natural grasses.

Rattan grows in tropical forests, where it twines about the trees in great lengths. It is numbered by dealers according to its thickness, and Nos. 2, 3, and 4 are the best sizes for small baskets. For scrap-baskets, 3, 5, and 6 are best sizes. It should be thoroughly soaked before using.

Raffia is the outer cuticle of a palm, and comes to us mostly from Madagascar.

While only a few weaves are described in this chapter, they are representative, and from them a great number of forms may be constructed.

A REED MAT

Before beginning a reed basket the student should make one or two centers in the form of a mat. The start is so important that it is necessary to master this before the subject of form has to be considered. A very attractive whisk-broom holder can be made by tying two of these mats together with ribbon.

MATERIALS

4 14″ spokes of No. 3 reed
1 8″ spoke of No. 3 reed
2 weavers' No. 2 reed

Soak the reed about an hour in cold water. Find the centers of the 14″ spokes and arrange them in pairs and cross them, placing the horizontal ones uppermost; place the 8″ spoke between the two vertical ones. These are held in place with the left hand and the weaving is done with the right hand.

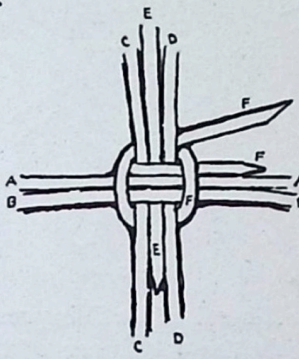


Fig. 1

An end of a weaver is placed along the upper horizontal spoke in front of the vertical ones, with the end toward the right (F, Fig. 1). Bring the weaver around back of the vertical spokes, and with the fore-finger of the right hand press it close to the center as it is brought over the horizontal spokes at the right of the center (bind in the end of the weaver also); next pass under the lower vertical spokes and over the horizontal ones at the left. Repeat this two or three times, and then, beginning with the upper vertical spokes, separate the spokes and *press* the weaver down, *between each* spoke, close to the previous row of weaving (Fig. 2). It is very

important to press the weaver down every time it crosses a spoke, and hold in position with the fore-

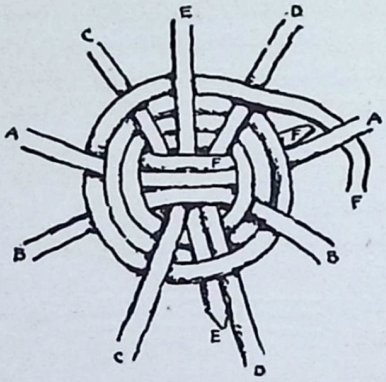


Fig. 2

finger of the left hand while it is pressed behind the next spoke with the forefinger of the right hand. (This applies to all reed-work.)

As soon as possible separate the spokes evenly and continue weaving until the mat is four inches in diameter.

The side of the mat or basket next to the worker is the outside, and all ends of weavers must be left on the inside.

To start a new weaver, place the end on top of

the end of weaver just used, and *behind* the spoke back of which it would naturally pass if the old weaver had been long enough to continue. The next row of weaving will hold these ends in place, and when the work is finished they should be cut off quite short.

When the mat is a little less than four inches, it should be bound off by passing the weaver under the last row of weaving, behind the next spoke, in front of the next and under the last row of weaving again. Continue this once around the mat, and, after cutting the spokes to an even length, soak the mat, and finish with an open border as follows:

Pass spoke No. 1 over spoke No. 2 at the right and push down beside spoke No. 3; do the same with each spoke in succession, being careful that at least one inch is pressed below the edge of the mat.

SMALL REED BASKET

Most reed baskets have at least sixteen spokes, and for small baskets and where small reeds are used these spokes are often woven in pairs (Fig. 3). A very pleasing effect is obtained by combining two shades of colored reed.

For the little basket given below (Fig. 2, page

237) natural-colored reed was used for the spokes and a golden-brown reed for weaving. These are the materials required for a small basket with sixteen spoke center:

16 16″ spokes, No. 2 reed
5 weavers' No. 2 brown reed

Separate the sixteen spokes into groups of four each. Mark the centers, and lay the first group on

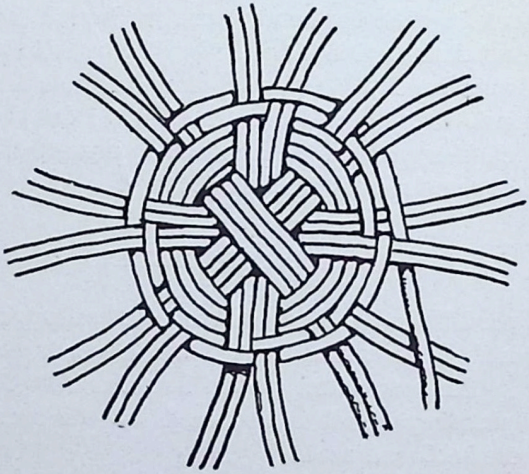


Fig. 3

the table in a vertical position. Across the center of this group place the second group horizontally. Place the third group diagonally across these, having the upper ends at the right of the vertical spokes. The fourth group is laid diagonally with the upper ends at the left of the vertical spokes.

A well-soaked weaver is started by laying the end over the group to the left of the vertical group, just above the center; then bring it under the vertical group, over the next, then under, and so on until it reaches the vertical group again (Fig. 3). This weave is repeated three or four times; then the spokes are separated into twos and the weaver is brought over the pair at the left of the upper vertical group, and so on, over and under, until it comes around again, when it is necessary to pass under two groups of spokes and then continue weaving over and under alternate spokes (Fig. 3, groups 1 and 2).

At the beginning of each new row the weaver passes under two groups of spokes; always under the last of the two under which it went before and the group at the right of it. This is the method of the Indians when they use an even number of spokes.

Weave the bottom until it is four inches in diameter; then wet and turn the spokes gradually up and

weave one inch; then turn the spokes in sharply and draw them in with three rows of weaving. Now weave four rows, going over and under the same spokes, making an ornamental band; then weave three rows of over- and under-weaving, followed by four rows without changing the weave. Continue to draw the side in with four rows of over- and under-weaving, and then bind off. Finish with the following border:

Always wet the spokes till pliable before starting the border; then each group is brought under the first group at the right and over the next and inside the basket; and cut long enough to allow it to rest on the group ahead.

Leave the first two groups a little loose, so the last ones can be woven into them easily.

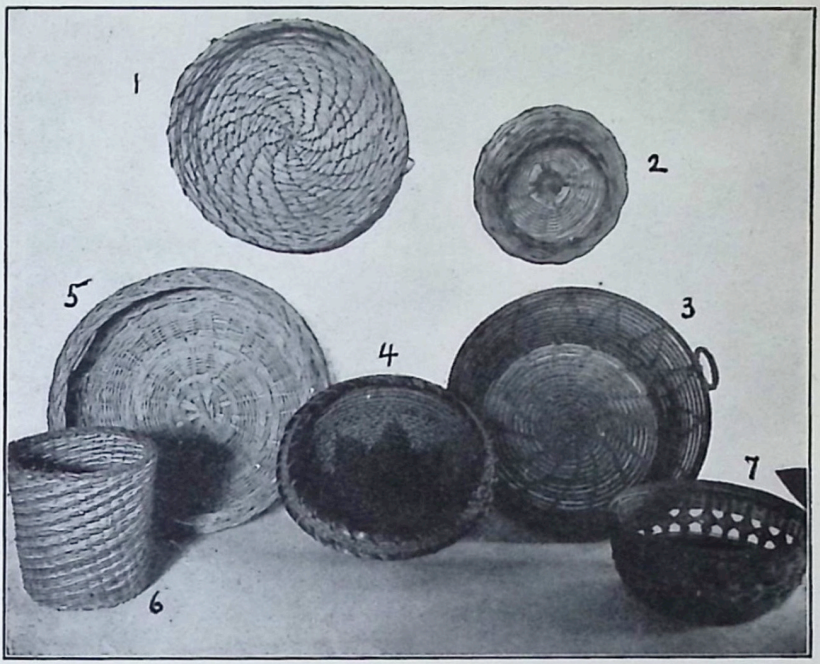
BASKET WITH TRIPLE TWIST

(Fig. 6, page 237)

MATERIALS

16 24″ spokes, No. 1 gray-green reed
8 weavers' No. 1 natural-colored reed
4 weavers' No. 1 gray-green reed

Weave the center as in previous basket until it measures two inches in diameter; then separate the



1. Coiled Basket of Natural Grasses
2 and 5. Reed Baskets
3. Samoan Weave (openwork)
4. Sewed Basket
6. Reed Basket (triple weave)
7. Flat Reed and Splint Basket

pairs of spokes and weave over and under each spoke separately until the bottom measures three and one half inches. Now turn up sharply and weave six rows of under- and over-weaving. By this time the spokes should stand quite straight, and the triple-weave is commenced by inserting two new weavers in addition to the one already started.

Insert a green weaver between the two spokes to the right of the one already in use; then place another natural-colored one between the two spokes to the right of the green one; then pass the first weaver in front of the first two upright spokes to the right, behind the third spoke and out. Now pass the colored weaver in front of the next two spokes to the right, behind the third and out. Do the same with the third weaver, and then begin with the first one again and continue until the basket is five inches high. Soak the mat and finish as follows:

(1) Pass each spoke in succession behind the one at its left and out; press down close to the basket; put the last spoke left standing under the first one turned down.

(2) Pass each spoke in succession in *front* of the one at its left and turn in; put the last one under the first one turned in.

(3) Pass each spoke in succession behind the one at the left and out; then press down sharply between the outside weave of the border and the basket; cut off with wire-cutters close to the border.

Fig. 4

TO MAKE A COILED BASKET
(Fig. 9)

Sweet-grass, corn-husks, or any pliable grasses can be used for these baskets, and with a contrasting color for sewing, very charming effects can be produced.

Cut off the hard ends of the grasses, and take only a small bunch for the center or start. Split the raffia very fine, and use a sharp needle for the tool. Hold the grasses and the end of raffia in the left hand, about two inches from the end of the coil, and wind the raffia around the coil to the end of the grasses (Fig. 5). Bend the end of the coil into a small round center and sew over and over, binding the first two coils very firmly together (Fig. 6). The next time around leave a very small space between each stitch, and take the stitch only through the upper protion of the

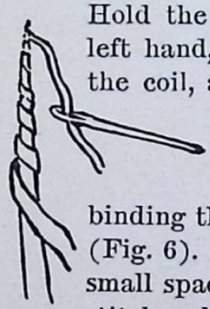


Fig. 5

coil below. It is necessary that the spaces between the stitches be very regular in the first few rows, as the regularity of the spiral is determined by them.

In sewing through the coil, place the needle diagonally from the right of the stitch through the coil to the left of the stitch (Fig. 10).

When the bottom measures four inches across, begin shaping the sides by raising the coil up slightly on the coil below, and continue to bind the coils together as before. When the basket measures about six inches across, begin shaping the sides by holding the coil slightly in toward the center.

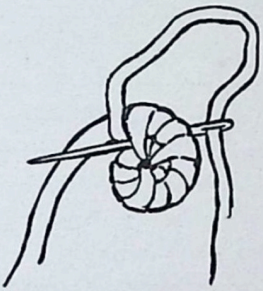


Fig. 6

To finish, gradually decrease the size of the coil, but do not increase the number of stitches; fasten the raffia, after taking the last stitch, by running it through the coil, and cut off close. If necessary to bind the ends more closely, sew over and over with a fine thread of very fine raffia the color of the grasses.

One should take great care to make a very neat and strong finish.

LAZY-SQUAW WEAVE—SEWED BASKET

Use a No. 4 reed to sew over. Trim the reed with a sharp knife one and a half inches from the end, gradually sloping to a flat point (Fig. 4).

Soak the reed in water about an hour. Use a No. 18 dull-pointed needle and thread with the end of the raffia which has been cut from the palm (the thick end).

Hold the reed in the left hand, draw it through the fingers of the right, shaping the end into a round coil. Hold the reed and the small end of the raffia firmly in the fingers of the left hand, about one and a half inches from the point. Wind the raffia around the reed to the point (Fig. 5). With the right hand force the end of the reed into the smallest possible coil and sew firmly through the center, binding entirely around the first coil.

Hold the commenced coil in the left hand and wrap the raffia from you and around the reed once; then over the reed again and down through the center of the coil (Fig. 6). This gives a long stitch, while wrapping the reed gives a short one. Continue weaving in this way, first a long stitch and then a short one, until the bottom is about five inches across.

Now we must plan for the design. In the basket shown in the photograph (Fig.4) the soft green used in the bottom is continued up the sides to form points.

An easy way to plan for the divisions of a design is to place the basket on a piece of paper and mark around it with a pencil, cut out, and fold into desired divisions. Place the basket on the paper again and mark the divisions with a pencil or thread.

To apply the raffia or introduce another color, hold the reed in the left hand, with the forefinger pressed firmly on the ends of both the old and the new thread, and wind the new thread tightly over the old thread; then proceed to take the stitch as before.

When the old and new threads are sufficiently covered to hold firmly, cut off both ends and continue weaving.

In the basket shown (the one with the star pattern) the points are made by introducing one stitch of natural color at each division for the last row of the bottom. Now begin forming the sides by placing the reed slightly over the last row. Each time the white stitch is reached, this time around, cover with three white stitches, and each time around increase the number of stitches, keeping the divisions equal on both sides of the point and the line of de-

Fig. 7

sign straight. When the green points have been reached, continue with the natural color for about two inches, when a band an inch wide of the Samoan stitch is introduced (see description on next page).

Continue now with the lazy-squaw stitch for an inch and a half. Now the sides are turned in by holding the reed slightly inside the preceding one, and weaving in this way for about an inch.

A roll of sweet-grass is bound around the top, and at the angle of the sides, with an overstitch of black split raffia. When it is necessary to splice on a new reed, trim the ends to be spliced to flat points, placing together in such a manner that the uniform size of the reed is kept. Prepare the reeds for joining before it is necessary to splice, and take great care that they fit. Hold the two reeds together carefully as you work over the splicing.

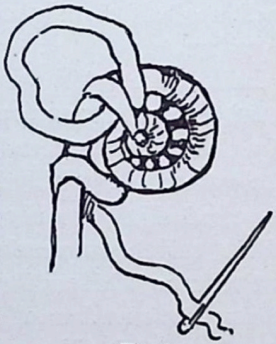


Fig. 8

SAMOAN WEAVE

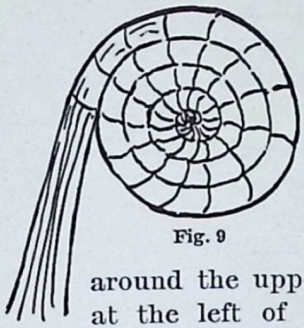


Fig. 9

The start is made in the same way as for the lazy-squaw basket.

After the first coil is finished, the reed is held about its own width from the coil. The raffia is brought from the center, over both reeds, around the upper one and between the two at the left of the wrapping; then passed back, between the two reeds, at the right of the wrapping (Fig. 7).

Look at the wrong side to see that the needle has passed to the right of the long stitch. Bring the needle through again, between the two reeds, at the left of the wrapping (Fig. 8). This completes the knot. Wind the reed twice and make another knot. Continue in the same way until the bottom is as large as desired, then turn up as previously described. In the basket shown

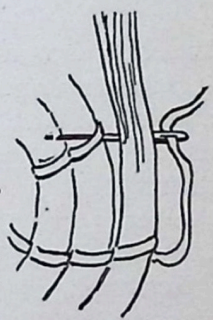


Fig. 10

(in photograph, Fig. 3) the bottom is woven with natural-colored raffia, and the sides with golden-brown. The knots in the bottom are placed each time at the left of the one on the row below, so that a spiral effect is obtained, and on the sides the knots are arranged in diamond shapes. Two reeds are held side by side to give the heavy band at the top, and are bound to the two below by a long and short stitch.

PLANT-BASKET

MATERIALS

16 42″ spokes of No. 4 reed
About 40 weavers of No. 4 reed
About 4 weavers of No. 4 Indian red reed
2 weavers of No. 4 black reed

It seems natural and fitting to use basket coverings for flower-pots, since basketry and pottery have always been closely associated. The basket covering answers two purposes: first, it protects the pot, and then it hides the angular form and brilliant color of the red ware, which so rarely harmonizes with flowering plants.

Let us choose a flaring jar form, such as the Indians of New Mexico often make in clay. One that

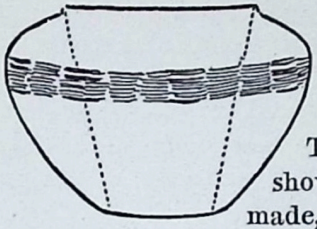


Fig. 11

will hold a flower-pot $6\frac{1}{2}''$ in diameter at the top will require sixteen 42″ spokes of No. 4 reed.

The sixteen-spoke center shown in Fig. 3, page 234, is first made, and the bottom is woven to a diameter of 6″. The spokes are then thoroughly wet and turned up with a decided outward flare. (See Fig. 11.)

The sides are woven, still flaring, for $4\frac{3}{4}''$, and then one row is made with a black weaver. This is followed by a band of Indian red in bam-tush weave (see Fig. 18) $\frac{3}{4}''$ wide; and above it two rows of the same weave, using a weaver of black and one of Indian red. The spokes are now wet until quite pliable, and bent in toward the center by rolling them over the finger.

Three rows are woven without drawing the weaver very tight, and then the spokes are brought in decidedly with a tightly drawn weaver for $3\frac{3}{4}''$, pressing them with the hand at the same time. Here the diameter of the top should be about $7\frac{1}{4}''$.

After wetting the spokes thoroughly the following border is woven:

First row. Each pair of spokes is brought under the pair on the right and outside of the basket.

Second row. Each pair of ends is brought across two spokes, under the first end on the right and pressed inside of the basket, where, when the border is finished, they are cut so that each will lie against the spoke ahead.

WORK-BASKET OF GREEN REED

MATERIALS

16 28″ pieces of No. 2 dark-green reed
32 11″ pieces of No. 2 dark-green reed
About 14 weavers of No. 2 light-green reed
16 large opaque white beads
16 large transparent green beads
An awl

Large kindergarten beads make an effective decoration on a basket of No. 2 reed.

A work-basket of two shades of green, with green and white beads, is woven as follows:

Sixteen 28″ pieces of No. 2 reed are arranged in the center, shown in Fig. 3, and a bottom 6½″ in diameter is woven. The spokes will then be so far apart that in order to continue the basket in firm,

close weaving additional spokes must be inserted. Thirty-two 11″ pieces of dark-green reed are cut and two of these are pressed in between each pair of spokes, which should first be separated by running a sharp-pointed awl down between the weaving. This will make four spokes in every group, which are wet until soft and separated into twos by the next row of weaving. The spokes are then turned up, away from the worker, with a decided outward flare, and the sides are woven 3″ high. After wetting the spokes until pliable, they are rounded in toward the center by bending them over the middle finger of the right hand. Seven rows of weaving are made, and then, with a very pliable weaver, the spokes are separated into ones. Two rows are woven on the single spokes, separating them evenly and taking care to press the weaver firmly down on the last row of weaving each time it crosses a spoke. At the end of the second row the weaver is cut, so that it will lie behind the last spoke in the row. An opaque white bead is now slipped on to this spoke and pressed down until it lies on top of the weaving. On the next spoke but one a transparent green bead is strung in the same way (see Fig. 12), and on the second spoke from it another opaque white bead.

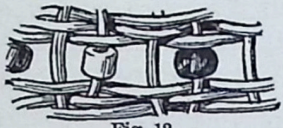


Fig. 12

Thus continue around the basket until there are thirty-two beads,—sixteen green and the same number of white,—alternating on every other spoke of the circumference of the basket. A pliable weaver is then started back of the spoke behind which the last weaver was cut, and woven on the single spokes for two rows, pressing the weaving down as far as the beads will allow. In the next row the spokes are again brought together in pairs, and eight rows, counting this one, are woven, bringing the spokes in more and more. The edge is bound off as already described, and the following border completes the basket:

Wet the spokes until pliable and bring each pair in turn over the next two pairs on the right, under the third pair, and over the fourth. The first three loops of the border should be left loose and open, so that the last spokes may be easily woven in. (See Fig. 13.)

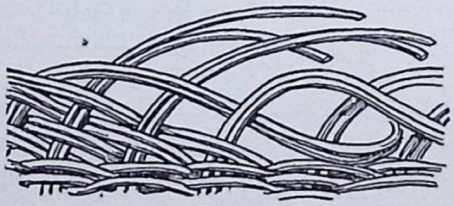


Fig. 13

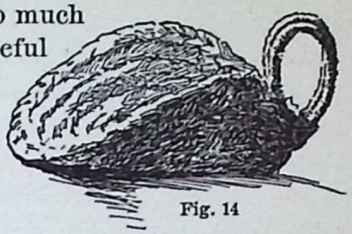


Fig. 14

Let us not depend too much upon reed and raffia, useful as they are, but when it is possible go to nature's storehouse for our materials, as the Indians do. From the common cattail-leaves which grow so plentifully in neighboring marshes charming things can be made. One of these is a scoop-shaped basket for strawberries or grapes (see Fig. 14), holding just enough for one person. On an invalid's tray, or at the out-of-door breakfast on a summer morning, this little basket, with its lining of green leaves, brings a suggestion of murmuring streams.

FRUIT-BASKET OF CATTAIL-LEAVES

MATERIALS

A bunch of dried cattail-leaves
Two pieces of No. 5 reed 5″ long
A bunch of gray-green raffia
A No. 18 tapestry-needle,

Gather the cattail-leaves for your basket in August, when the tips are beginning to dry; if they

are cut later they are apt to be too brittle, and if earlier the color does not hold. Dry them in a room where little or no sunlight comes,—an attic is a good place,—spreading them on a floor or shelf, and turning them occasionally that they may dry evenly. When perfectly dry, or cured, lay them in a damp cloth until pliable; or, if this process takes too long, wet them in lukewarm water until soft. Take three full-length leaves and, tying the tips together with raffia, braid them in a three-stranded plait, keeping the strands quite flat and the edges straight and true. When it becomes necessary to add a new piece, lay it with its short end turning up over the old end, and proceed with the plaiting. (See Fig. 15.) When about four yards have been plaited, cut the ends of the leaves close to where they were bound at the beginning, and, taking a needle threaded with a fine strand of gray-green raffia, coil the plait on itself into the smallest possible circle and stitch it firmly. Bring the long end around, with its inner edge just under the first coil, and sew it through and through with stitches that run the same way as the loops of the braid. Continue this coiling until the mat shape

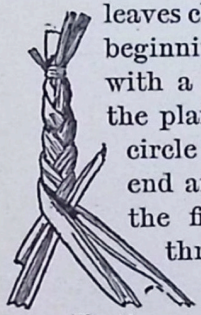


Fig. 15

is 7″ in diameter. At the end of the last row the braid is brought gradually under the previous row, where it is cut, and after binding the end with raffia, to keep it from ripping, it is stitched firmly in place against the under side of the mat. A handle is then made as follows:

Take two 5″ pieces of No. 5 reed which have been soaked in warm water until pliable, and a full length cattail-leaf, also wet. Place the two pieces of reed together, and lay the short end of the leaf under the one on the left. Bring the long end over the piece of reed on the right, around it and over the left-hand piece; around this, and again over and around the piece on the right. (A piece of raffia bound about the handle at the start and tied securely will prevent it from ripping. See Fig. 16.) This process is continued, pressing the stitches close together, until the reed is entirely covered. A raffia binding also secures this end. One end of the handle is sewed firmly against the under side of the mat where the last row of plaiting ended, at half an inch from the edge. The other end of the handle is wet

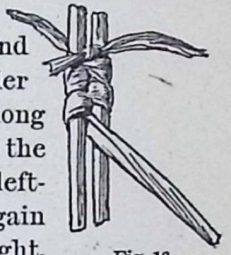


Fig. 16

until pliable, and bent over to meet the first end, stitching it firmly in place. The sides of the mat are then pinched together and sewed through and through between the ends of the handle and in front of it (see Fig. 14), so that it forms a scoop shape. This completes the basket.

RAFFIA BASKET IN BAM-TUSH WEAVE

MATERIALS

16 16″ pieces of No. 2 reed
A bunch of natural-colored raffia
A bunch of colored raffia
A sharp-pointed awl
A No. 18 tapestry-needle.

One of the simplest and most satisfactory of the Indian weaves is called by them bam tush. It may be woven entirely of reed, or charming baskets are made with it, using raffia and other soft vegetable fibers on reed spokes. The Indians of Alaska use sea-grass or bark in weaving this stitch, while those living farther south employ glistening white squaw-grass and the stems of maidenhair fern. One of the great attractions of the weave is that it is done almost entirely with the hands, no needle being used except

in binding the edge of the basket. The only tool necessary is a sharp-pointed steel awl, such as one can buy at a hardware-store.

It is advisable to wash the natural-colored raffia with warm water and some pure white soap, rinsing well and letting it get almost dry before using.

The center is a simple one. Sixteen sixteen-inch pieces of No. 2 reed are cut and the center marked with a pencil. Eight pieces are held together about $\frac{1}{4}''$ below the pencil-marks.

An end of a strand of raffia is doubled around the pair of spokes next to those on the left of the group (see Fig. 17); the short end is turned up and the long one is brought over the pair of spokes on the right, under and around the next pair and back, under and over alternate spokes to the left side, where it is brought around the outside group and back again.

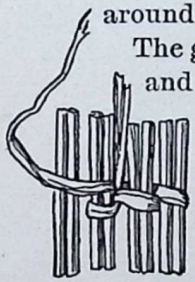


Fig. 17

The groups should be drawn close together and each stitch pressed down on the weaving below so that no reed shall show. When the center is as deep as it is wide, eight more spokes are bound together, in the same way, with another strand of raffia. These are laid horizontally back of the first

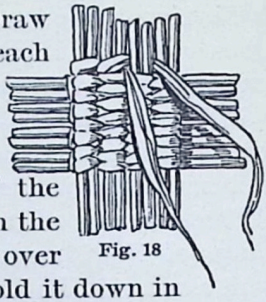


Fig. 18

set, which is held vertically. Draw the long end of raffia from each group between the two halves of the center, bringing one out on the left of a pair of spokes and the other on the right of the same pair. Taking the strand on the left of the two spokes, bring it over this pair, under the next, and hold it down in front of the work with the left hand, while the right brings the other strand over a pair, under one, and down in front in the same way. (See Fig. 18.) This is continued around the center, using always the strand on the left and bringing it over a group, under the next, and down in front. In the next row the spokes are separated into ones and those at the corners drawn close together with the weaving. The spokes should almost touch ; and when, after a few rows, they begin to be so far apart that the stitches are not as small as at first, new spokes are inserted. Prepare eighteen or twenty of these spokes at a time, cutting them about an inch longer than the distance from the edge of the weaving to the ends of the original spokes. Whittle each to a long, sharp point. Lay the woven center on a table, and choosing a

place where an extra spoke is needed, run the point of the awl down between the weaving, beside a spoke, draw it out and push in the pointed end of a new spoke. This need not be done with absolute regularity, but wherever the stitches seem too large and the spokes too far apart. A little patience in inserting enough spokes to make the work firm and even will be amply repaid in the solid, substantial weaving and even texture of the finished basket. When it comes time to turn up the sides, the spokes are wet until pliable and bent over the finger, as in the all-reed baskets. Many designs may be wrought by using one colored weaver and one of the natural color and combining triple twist with the bam-tush weave. Straight lines of color are obtained by using two weavers of different colors in bam tush on an even number of spokes. With an uneven number the lines will be diagonal.

To finish the top of the basket, cut every other spoke close to the weaving and whittle the alternate ones to a long point about 1½″ above the weaving. Now wet these pointed spokes until pliable and bring each in turn back of the next spoke on the right and outside of the basket, pressing it close down on the weaving. Cut the ends so that each

will lie against the spoke ahead. Lay a few strands of raffia along over this border and with a No. 18 tapestry-needle, threaded with raffia, bind the edge over and over with stitches that pass under the last row of weaving in the basket.

CHAPTER IX

BEAD-WORK

Simple Chain Patterns.
Simple Loom Patterns.
Indian Designs for Loom Work.

CHAPTER IX

BEAD-WORK

AMONG the primitive arts lately revived, bead-weaving holds a place of secondary importance indeed; yet it possesses distinctive artistic value, especially in the making of small articles. The juxtaposition of small spots of pure color, through which the light plays, arranged in simple patterns gives an effect unlike that of any other material, and is especially appropriate for necklaces, watch-charms, small pouches, belts—things useful in themselves or which serve to relieve the dress.

The tools needed are simple and easily obtained. For the first problems some strong linen thread and No. 12 bead-needles are sufficient. Beads of any size and price may be purchased at any kindergarten

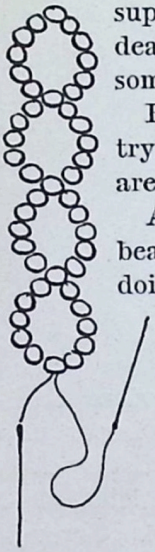


Fig. 1

supply store, of any arts crafts dealer, the dealers in Indian and Mexican goods, or at some department store.

Bead-work is very simple, but somewhat trying to the eyes, especially if the beads are small and the colors not of the best.

A good problem for beginning is stringing beads for a chain. A very effective way of doing this is suggested in Fig. 1, and this may be varied by the size, number, and color of the beads and the length of the loops.

Take two No. 12 bead-needles filled with thread, and fasten the ends of both securely to a single bead. On each thread string five beads, or more if the beads are small, and then carry both threads through a single bead (Fig. 2). Again take the same number of beads on each thread and carry the threads through a single bead, and so on, repeating the pro-

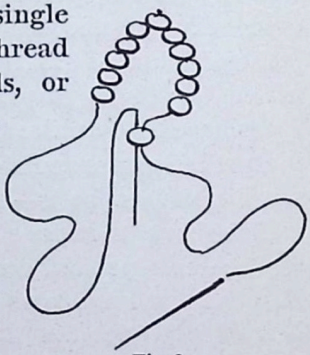


Fig. 2

cess until a chain of the desired length is completed.

In Fig. 3 both threads are carried through three beads at the center, to vary the problem.

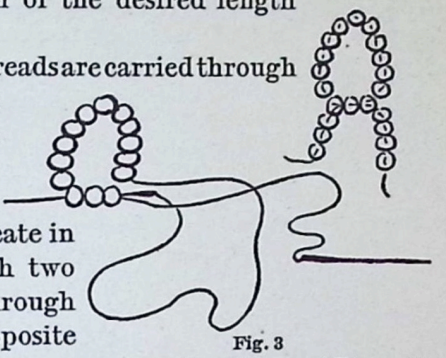


Fig. 3

Another chain which is very delicate in itself, is made with two threads drawn through a single bead in opposite directions (Fig. 4) next a bead on each thread, both threads being again drawn through a single bead from opposite sides, and so on, as in Fig. 5. In this design two colors, a light and a dark, should be used, and the units may be brought out as in Fig. 6, in this way making a + or a × design.

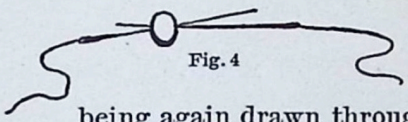


Fig. 4

Fig. 5

An easier way of constructing either of the previous chains is to string a single strand first, this strand to be made up of any number of

Fig. 6

beads in groups of five forming one side of the loop, alternated with the center bead or beads in the manner of Fig. 7, *a*; then taking the second thread, which is attached to the first bead, string five beads and

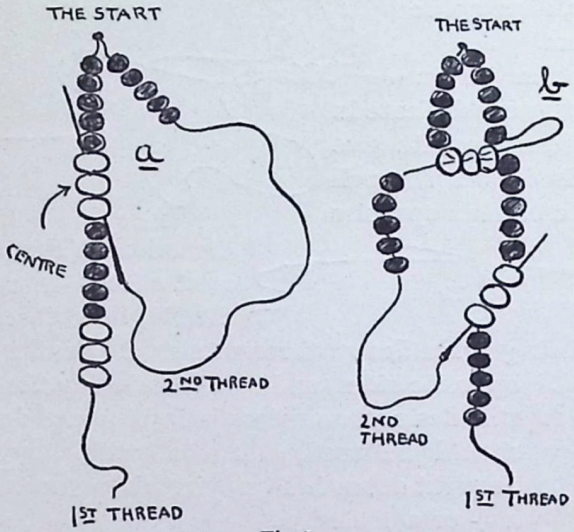


Fig. 7

carry the thread back through the next three beads, thus taking the position *b*, Fig. 7. The principle is the same as in the other method, but it is easier to handle one needle at a time.

There is another weave made upon diagonals and requiring no loom. Let us suppose the design calls for a width of eight beads; for in the warp and weft weaving an even number is best.

Fasten a bead securely to the end of the thread and, counting it as one, string the required number—in this case eight beads. Now string a bead and, carrying the needle through the seventh bead, draw the thread tight. String another bead and pass the needle through the fifth one. Continue in this way, stringing a bead each time before passing the needle through the next bead but one to the one it just went through, until the end of the line is reached. When the work is turned, a bead is strung and the needle passed through the next bead but one to the edge. This process is repeated until the entire length is woven.

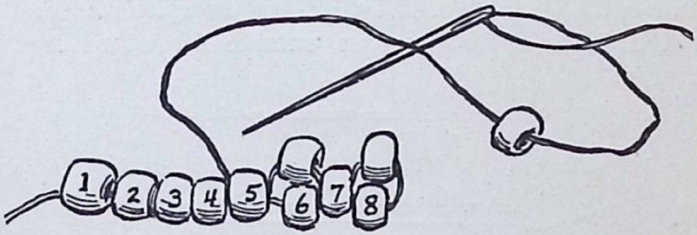


Fig. 8

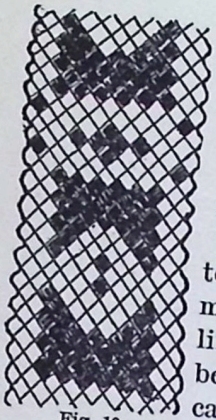


Fig. 10

With large beads, fine wire may be used instead of thread, especially in work where strength is required. Fig. 10 suggests a design for this weave, and might be extended to form a belt.

For work on the loom, in addition to the No. 12 needle a spool of linen machine-thread and a coil of fine linen thread are needed. Special bead-needles, which are fine yet long, can be procured for this purpose.

The loom is a very simple affair, easily constructed. It consists of a stout piece of wood 1″ or $1\frac{1}{2}$″ wide and 1′ long, supporting two upright ends about $3\frac{1}{2}$″ wide x $2\frac{1}{2}$″ or 3″ high.

Small headless nails or brads are driven across these ends $\frac{1}{16}$ apart (see Fig. 11) and an upholsterer's tack fastened below on the outside for attaching threads.

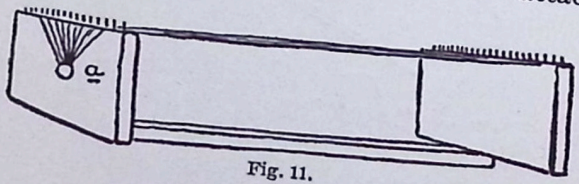


Fig. 11.

For the first exercise, tie together the long threads, (the warp) their number being one more than the number of beads in the width of the band to be woven. Fasten the knot on the tack provided for that purpose (Fig. 11, *a*), and bring the threads over the top of the loom, between the nails, as in Fig. 12, to the opposite end, and then down, fastening them to the tack upon that end.

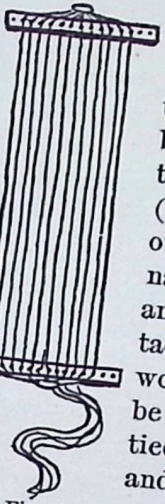


Fig. 12

If the piece of work requires long threads, these may be wound about the supporting bar and tied. Or they may be tied to the tack and wound up on a coil of paper or a spool.

In this work an even number of warp threads is advisable, as this gives you a center row of beads and makes the designing simpler.

We will suppose there are eight threads stretched across the loom. String seven beads upon a long thread, keeping hold of its end; place the seven under the warp threads, so they may be

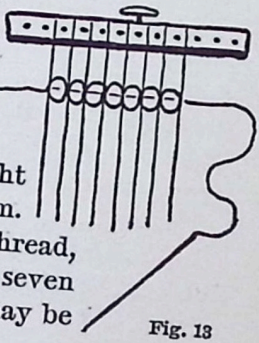


Fig. 13

pushed up between the threads and held with the finger (Fig. 13); then carry the thread (the weft) back through the beads but above the warp, and tie the loose end to the thread in the needle.

The beads are thus securely fastened between the warp threads. String seven more beads and repeat the operation, and so on indefinitely, constructing a watch-chain, or necklace, or what not.

We have now to face the limitations of our medium in design.

Original designs are made by drawing lines to represent the warp, and crossing them with lines representing the weft threads, thus forming little squares of size corresponding to that of beads used. The squares are then filled in with black and white or color to represent the beads.

This limits the design to rather rigid abstract forms, and simple units are most effective with accents of strong dark color.

Opaque white beads form the best background, as a greater variety of color and quality of beads blend and harmonize with them.

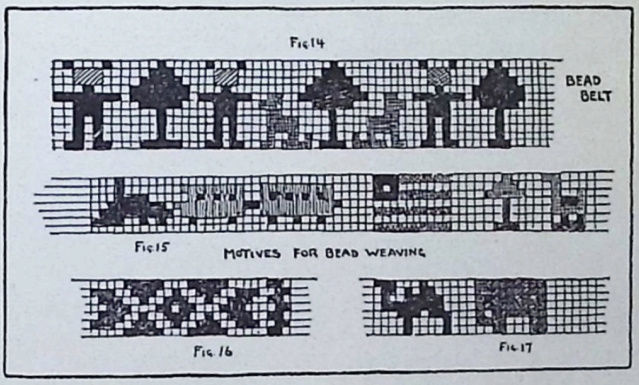
Indian designs, as is the case with all of the primitive arts, furnish the simplest and best motives.

Plant forms and animals may be adapted, as in

Figs. 14 and 17, and even the human form may be broadly conventionalized. If you would go directly to nature, I cannot think of any better material than a snake-skin. Procure some of the squared paper of about $\frac{1}{8}''$ squares, and if you are fortunate enough to be near the Bronx Park in New York, or similar collections, spend half a day with our friends the diamond-back rattlers and their kind, jotting down design motives copied from their backs.

Or perhaps you can overcome a natural repugnance sufficiently to study one of our common harmless black and yellow snakes at close quarters.

The butterflies and moths are also unfailing



sources of suggestion because of their many abstract line combinations and multitude of rich colors in harmonious relation.

And now finally let me say:

Every worker in the crafts who is not already schooled in design, should begin at once some continuous study of the principles of structure and decoration.

Without this knowledge you may indeed progress, but you will be seriously handicapped in the practice of any craft.

To know his own work from A to Z is a cardinal principle of every good craftsman.

If instruction under a good teacher is not possible, purchase one or two standard works on the subject, or consult the books of your public library.

Set yourself to learn at least the rudimentary principles of ornament, and then you can feel that your work, from its inception to the last tool-mark, is thoroughly your own.

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